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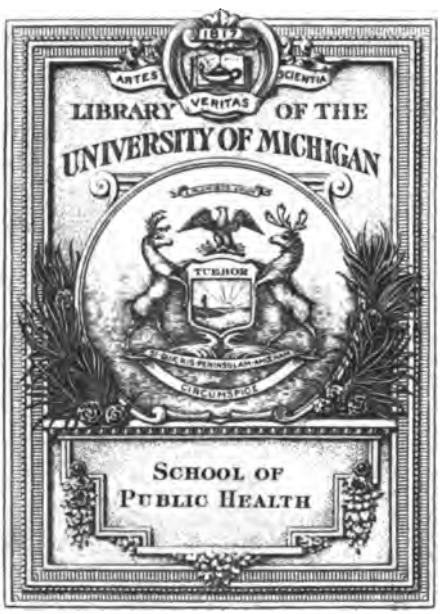

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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

HYGIENIC LABORATORY—BULLETIN No. 101
AUGUST, 1915

I. COMPLEMENT FIXATION IN TUBERCULOSIS

By A. M. STIMSON

II. REPORT OF AN INVESTIGATION OF DIPHTHERIA CARRIERS

By JOSEPH GOLDBERGER, C. L. WILLIAMS, and F. W. HACHTEL

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By H. E. HASSELTINE

V. A MODIFICATION OF ROSE'S METHOD FOR THE ESTIMATION OF PEPSIN

By MAURICE H. GIVENS

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COMPLEMENT FIXATION IN TUBERCULOSIS.[1]

By A. M. Stimson, *Surgeon, United States Public Health Service, Washington, D. C.*

Complement fixation has been investigated in its relations to tuberculous infections from several points of view; from the standpoint of its bearing on clinical medicine to discover whether it was of value in the diagnosis, prognosis, or in controlling the specific therapy, of tuberculosis in man; from the standpoint of pure pathology to determine what light it might throw upon the essential nature of the disease and immunity thereto; and from the position of the veterinary official who is in search of diagnostic methods less susceptible of evasion than those commonly employed.

Undoubtedly the chief interest has centered around the diagnostic and prognostic possibilities of the reaction. In the interest of the individual patient, as well as of public health, early diagnosis is essential, and any test which will aid in this direction, or assist in estimating the progress of the battle between the patient and his disorder would be a welcome addition to our resources. The procedures now commonly employed leave much to be desired, there being little doubt that many cases of tuberculous infection escape detection by them until significant or irreparable damage has been done. Moreover some of them, notably the von Pirquet and some other tuberculin tests, are rendered valueless except in restricted groups of persons by the very reason of their delicacy, and their persistance after the subsidence of activity and the establishment of cure.

The earlier work with complement fixation in connection with tuberculosis gave such contradictory results that little hope was promised of practicable employment of the method. The more recent work, however, tends to approach unanimity as to the significance of the reaction. In the following table the work of the past few years is briefly reviewed, the arrangement being such as to permit a comparison of the methods employed and the results obtained.

[1] Manuscript submitted for publication Apr. 15, 1915.

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Tabulated review of recent literature.

Authority and references.	Methods.	Hemolytic system.	Antigens.	Materials examined.	Results.
1. Ruppel and Rickmann. Zeit. f. Immunitatsfg., 1910, VI, 344.	Wassermann, Bruck, and Citron.	Sheep cells; rabbit amboceptor; guinea pig complement.	Old tuberculin.....	Herbivores, normal and tuberculous, with and without tuberculin treatment.	Complete fixation only in tuberculous animals and those treated; no fixation in some tuberculous animals.
2. Laub..... Ibid., 1911, IX, 126.	.....do.....	.....do.....	.....do.....	Guinea pigs, rabbits, and goats.	No fixation with normal animals nor with those treated first with killed tubercle bacilli and then with tuberculin. In tuberculous animals, injections of tuberculin produced fixing bodies, as they did also in the normal horse.
3. Schultz..... Idem., 709.	Reduced volumes.....	.....do.....	Old tuberculin and bacillen emulsion.	Tuberculous and healthy persons.	Old tuberculin gave strong fixation in 15 of 77 tuberculous cases, and in 3 of 162 nontuberculous cases. Bacillen emulsion gave strong fixation in 5 of 34 tuberculous cases, and none of 115 nontuberculous. Milder grades of fixation given by each antigen in both classes, but less often in the nontuberculous.
4. Borissjak, Sieber and Metalnikow. Ibid., XII, 65.	.....	.....do.....	Various products of tubercle bacilli and lecithin.	Animals treated with these antigens.	Tubercle bacillus wax, fat-free tubercle bacilli, and lecithin caused the greatest production of antibodies. Tuberculin does not cause antibody formation, but hinders it. The antibodies are not specific for the antigens administered.
5. Porter..... Jour. Hygiene, 1911, XI, 112.	Tests secondary to precipitin test; large amount of rabbit serum.	.....do.....	Filtrate from milled and shaken tubercle bacilli, human and bovine.	Tuberculous and healthy cows.	With bovine antigen 88 per cent tuberculous animals and 18 per cent normal gave positive reaction. With human antigen 72 per cent of tuberculous and 19 per cent of normal animals were positive.
6. Caulfield..... Arch. Int. Med., 1911, VIII, 440. Caulfield and Beatty. J. Med. Res., 1911, 24, 122. Caulfield. Ibid., 128.	Wassermann.....	.....do.....	Bacillen emulsion; old tuberculin; alcohol-ether extract of tubercle bacilli.	Human tuberculosis..	Antigen. Cases, Turban classification. I. II. III. B. E. (positive). 33 per cent. 70 per cent. 62 per cent. O. T. (positive). 10 per cent. 48 per cent. 44 per cent. No fixation in clinically normal cases. Usually positive in more unfavorable type of tuberculous cases. Negative reactions may be due to the presence of inhibiting substances which can overcome large anticomplementary doses of antigen, causing hemolysis. Believes that whether the reaction is of fixation, inhibitory, or indifferent (negative) is of prognostic value.
7. Debre and Paraf.... Compt. Rend. Soc. Biol., 1911, 228 et seq.	Using known antituberculous serum to demonstrate antigen.	.....do.....	Sought for in pathological fluids; pleuritic, ascitic, and urinary.	Tuberculous and normal subjects.	Found high degree of specificity in the test, especially in the urine of renal tuberculosis. The test is for the presence of antigen, not antibody.

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8. Dellmann. Zeit. f. Immunitätsfg., 1911, X, 421.	Not detailed.		Carbolized emulsions of T. B. and other acid fasts; tuberculin; partial antigens.	Human sera.	Findings in accord with those of Much (15). Group fixation of acid fasts with quantitative differences. Fixation in the clinically nontuberculous. Fixation indicates only a previous contact with the virus.
9. Laird. Jour. Med. Res., 1912, XXVII, 163.	Wassermann.	Sheep cells; rabbit amboceptor; guinea pig complement.	Watery emulsion of tubercle bacilli.	Tuberculous patients.	Fixation in only four of 34 cases. Article contains valuable suggestions.
10. Mollers. Cent. Bact. ref., 1912, LIV, Beiheft, 202.					Fixation reactions permit no diagnostic or prognostic conclusions. In human serum they indicate merely previous contact with the virus of tuberculosis.
11. Hammer. Deutch. Tierarst. Woch., 1912, XX, 593.	v. Dungern, modified by room temperature incubation.	Ox cells.	1, old tuberculin; 2, extract of tuberculous nodules; 3, mixture of 1 and 2.	48 tuberculous cows. 48 nontuberculous cows.	Fixation in all, autopsy control. Fixation in 2; probably small foci overlooked.
12. Hammer. Munch. med. Woch., 1912, LIX, 1750.	do.	do.	do.	46 tuberculous persons.	43 strongly positive, 2 weakly positive, 1 negative, perhaps a healed case.
13. Zweig. Berl. klin. Woch., 1912, XLIX, 1845.	Original. Active serum in two series, one with and one without antigen; colorimetric reading of hemolysis.	Complement in patient's serum; sheep cells; 5 units of amboceptor.	Bacillen emulsion.	Tuberculous and nontuberculous persons, a small series.	In general fixation is proportional to severity. No fixation in 2 rapid cases and 1 healed gland case. Fixation in 2 scarlatina cases. Bovine emulsion sometimes positive where human is negative.
14. Calmette and Massol. Compt. Rend. Soc. Biol., 1912, LXXIII, 120. Calmette and Masie. Ibid., 1913.	Bordet-Gengou.	Sheep cells; rabbit amboceptor; guinea pig complement.	Preparations from tubercle bacilli; A, dialysible exobacillary antigen; B1, water-soluble endobacillary antigen: B2, water-insoluble endobacillary antigen. (Peptone-soluble.)	134 cases human tuberculosis.	Fixation in 5.96 per cent cases with antigen A, B1, and B2. Fixation in 40.28 per cent cases with antigen B1, and B2. Fixation in 46.25 per cent cases with antigen B2. Fixation in 92.49 per cent cases altogether. The reaction is of diagnostic value. Antibodies shown by B2 appear early, those by B1 in late stages. Disappearance of B1 antibodies indicates aggravation of the disease.
15. Much. Munch. med. Woch., 1912, LIX, 685.			Various acid-fast bacteria and partial antigens prepared from them.	Tuberculous and healthy persons.	Various antigens gave fixation with tuberculous serum, the other acid-fasts differing only quantatively from the tubercle bacilli. Healthy persons gave fixation with tuberculin and tubercle bacilli emulsions in 77 per cent of cases. The specific antigens of tubercle bacilli are probably contained in both the fatty acids and proteins.

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Tabulated review of recent literature—Continued.

Authority and references.	Methods.	Hemolytic system.	Antigens.	Materials examined.	Results.
16. Calmette and Massol. Compt. Rend. Soc. Biol. 1912, LXXIII, 122.	Bordet-Gengou.....	Sheep cells; rabbit amboceptor; guinea pig complement.	1, killed and concentrated liquid cultures of tubercle bacilli; 2, same, minus bacteria; 3, watery extract filtered tubercle bacilli; 4, peptone extract of tubercle bacilli.	Serum of tuberculous persons treated with these antigens.	The greatest augmentation of antibodies followed the use of No. 3, and persisted 1 or 2 months after treatment.
17. Meyer, Kurt..... Zeit. f. Immunitatsfg. 1912, XIV, 359.	.....	.....	Various derived portions of tubercle bacilli.	Hoechst antituberculous serum.	The fixing properties of tubercle bacilli for this serum are contained in 2 fractions, probably phosphatid derivatives. Fat, fatty acid, and waxlike fractions have slight or no fixing properties for this serum.
18. Letulle..... These Fac. Med. Paris. 1912.	Bordet-Gengou.....	Sheep cells; rabbit amboceptor; guinea pig complement.	Calmettes: 1, water-soluble; 2, water-insoluble antigens.	Tuberculous and nontuberculous persons.	89 per cent of tuberculous cases gave fixation. In general patients with resistance give fixation. Calmette's inhibiants verified.
19. Aoki..... Zeit. f. Immunitatsfg. 1912, XIII, 192.	Modified Wassermann.	Sheep cells.....	Not described.....	Tuberculous and treated rabbits.	Complement fixing bodies and also spontaneous hemolysis restraining properties of serum increase in definite curves, the relation of which is significant. In infection they are parallel, but in immunizing experiments they are at times opposite in direction.
20. Fraser..... Ibid., 1913, XX, 291.	Wassermann..... In some tests removed human antisheep amboceptor.	Sheep cells; rabbit amboceptor; guinea pig complement.	Great variety.....	Tuberculous and nontuberculous persons.	The best antigen is an emulsion of living tubercle bacilli. Removing the human antisheep amboceptor increases the positive results. Syphilitic serum may give a positive reaction. Otherwise nontuberculous serum gives negative results from the test.
21. Dudgeon, Meek and Weir. Lancet, 1913, CLXXXIV, 19.	Wassermann.....	.....do.....	.....do.....	Tuberculous persons.	1. Patients not given specific treatment, 85 per cent positive. 2. Patients specifically treated, O. T. or B. E., 100 per cent positive. 3. Arrested cases, 74 per cent positive. Killed tubercle bacilli emulsion the best antigen. Consecutive tests on the same patient are informative.
22. Harris and Lanford. Jour. Inf. Dis., 1913, XIII, 301.	Not detailed.....	.....do.....	Various acid-fast bacilli, whole or as Besredka antigens.	Serum of rabbits treated with these antigens.	Besredka antigens produced the most powerful sera. Group fixing bodies shown, not specific for the strains employed.

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23. Bang and Andersen. Cent. Bact. orig. 1913, LXIX, 517.	Modified Wassermann.	Goat cells; rabbit amboceptor: guinea pig complement.	Emulsion of killed tubercle bacilli preserved with phenol; tuberculin.	Cattle, with and without tuberculosis and other acid-fast infections.	Strong reactions have diagnostic significance. In general they are proportionate to the severity of infection. Other acid-fast infections (Johne's disease) give the same reaction as tuberculosis. An emulsion of tubercle bacilli is a good, and tuberculin is a poor antigen.
24. Armand Delille, Rist, and Vaucher. Compt. Rend. Soc. Biol. 1913, LXXIV, 791.	.....	.....	Crude tuberculin; Calmette's endobacillary antigens.	Human tuberculosis, 100 cases.	With crude tuberculin, 4 per cent gave a definite positive and 30 per cent a partial reaction. With the water-soluble antigen 20 per cent were definite and 25 per cent partial. With the peptone-soluble antigen 92 per cent gave a definite reaction.
25. Wyschelesky..... Zeit. f. Tuberk. 1913, XIX, 209.	Wasserman.....	.....	Phymatin; emulsion of tubercle bacilli; solution of tubercle bacilli in 2 per cent lactic acid.	Cattle, tuberculous and nontuberculous.....	Phymatin the best antigen. Fixation in 18.1 per cent of tuberculous and 9.7 per cent of healthy cattle.
26. Bundschuh..... Zeit. Hyg. 1913, LXXIII, 427.	.....	.....	.....	.....	Found that antibody formation (fixation) was induced in healthy as well as in tuberculous animals following the injection of tuberculous antigens.
27. Francescelli..... Zeit. f. Immunitatsfg. 1913, XX, 309.	.....	.....	.....	.....	Contrasted to Bundschuh, found that antibody formation was induced only in tuberculous animals.
28. Kinghorn and Twitchell. Zeit. f. Tuberk. 1913, XX, 11.	Wassermann, one-half classical amounts.	Sheep cells; rabbit amboceptor; guinea-pig complement.	Bacillen emulsion.....	Tuberculous and healthy persons.	Of 7 healthy persons, fixation in none. Of 8 incipient tuberculous cases, fixation in 37.5 per cent. Of 14 advanced tuberculous cases, fixation in 93.33 per cent. Of 3 healed cases, fixation in 100 per cent. They attach no prognostic value to the test.
29. Calmette and Massol Compt. Rend. Soc. Biol. 1913, no. 28, 160.	(See 14, 16).....	.....	.....	.....	Inhibiting bodies which prevent fixation in some sera, are removable by diluting, heating to 57° C., and passing CO_2 gas through the serum.
30. Rothe and Bierbaum Deutch. med. Woch. 1913, no. 14, 644.	No details.....	.....	Watery extract of tubercle bacilli, preserved in glycerin and phenol.	Cattle, healthy and tuberculous; before and after treatment.	No strong fixation before treatment except in a small percentage of tuberculous cattle. Killed, whole tubercle bacilli, intravenously, produced the most antibody, and did so in healthy and tuberculous cattle.
31. Momose..... Ibid. no. 22, 1029.	Few details; active serum.	.....	Bodies of tubercle bacilli, after extraction of fat.	Persons.....	Fixation was obtained in all phthisical persons, and in nearly all exposed by association and suspected persons. Of sick persons not suspected of tuberculosis one-half reacted. One-third of apparently well persons reacted.
32. Besredka..... Zeit. f. Immunitatsfg. 1914, XXI, 77.	.....	.....	Author's special egg medium antigen.	Tuberculous and nontuberculous persons, rabbits, and guinea pigs.	1, human: In the first stage of tuberculosis the reaction is always positive; in the second stage nearly always; in the third often partial or negative. 2, animal: The antibodies in infected animals follow curves which vary with the type and method of infection.

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Tabulated review of recent literature—Continued.

Authority and references.	Methods.	Hemolytic system.	Antigens.	Materials examined.	Results.
33. Wwedensky, rev. by Wulffius. Ibid. referat., 1914, VIII, 931.	Wassermann		Various tuberculins, suspensions, and extracts.	Tuberculous and nontuberculous persons and animals.	In 62 tuberculous cases 82.8 per cent were positive and 16.2 per cent doubtful. In 20 suspected cases 55 per cent doubtful, 45 per cent negative. All of 10 nontuberculous cases were negative. In 24 lupus cases 41.6 per cent were positive, 58.4 per cent negative. Of 82 tuberculous animals 52.4 per cent were positive, 40.2 per cent doubtful, and 7.4 per cent negative. Of 77 nontuberculous animals all were negative. Incipient and healed cases give weak reactions; pronounced cases give more and stronger reactions. At least 5 different antigens should be used. Best results from suspensions and extracts.
34. Debains and Jupille. Comp. Rend. Soc. Biol., 1914, LXXVI, 199.	Constant amounts of antigen and serum; varied amounts of complement.		Besredka's egg medium antigen.	About 600 persons, tuberculous and nontuberculous.	Reaction very sensitive in all forms of tuberculosis except miliary and meningeal. Absent in the healthy. Advanced grave cases and those on the road to recovery frequently give partial or negative reactions. Syphilitic antibodies also react to this antigen.
35. Kuss, Leredde and Rubinstein. Ibid., 244.	2 different methods multaneously.	Sheep cells; rabbit amboceptor; guinea pig complement.	do	Tuberculous and nontuberculous persons.	Well-developed cases of pulmonary tuberculosis are positive in 89 per cent. Mild, nonprogressive cases positive in two-thirds. Nontuberculous cases are negative, except those giving positive Wassermann reaction for syphilis.
36. Inman. Ibid., 251.	Amounts of serum varied; other reagents constant.	Sheep cells	do	do	In 100 cases of pulmonary tuberculosis 95 per cent were positive. In 50 suspected cases 60 per cent were positive. In 100 patients in hospital for nontuberculous disease 24 per cent were positive, but not in high dilutions. A negative reaction indicates either the absence of tuberculosis or the arrest of a former lesion. A positive reaction indicates (especially in high dilutions) an active tuberculous lesion.
37. Bierbaum and Berdel. Zeit. f. Immunitatsfg., 1914, 21, 1–5, 249.	Hammer's; room temperature incubation.	Sheep cells; guinea pig complement.	Bovine old tuberculin; extracts of tuberculous tissue.	Serum of 120 slaughtered cattle.	Autopsy findings and serological findings agreed in only 65 per cent of cases.
38. Calmette and Massol. Annal. d. l'Inst. Past., 1914, no. 4, 339.	(See 14, 16)				The "inhibitrice," which may be present in a serum and prevents fixation by the antibody, acts on the antigen, but may be overcome by an excess of the latter.

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39. Davidovics..... Deutsch. med. Woch., 1914, XL, 1, 21.	Not detailed.....	Ox cells; rabbit amboceptor; guinea pig complement.	Old tuberculin.....	Tuberculous cases.....	The immune body causing fixation with O. T. is thermolabile and not shown in inactivated serum.
40. McIntosh and Fildes Lancet, 1914, II, no. 8, 485.	Modified Wassermann.	Sheep and ox cells; guinea-pig complement.	Fresh, living tubercle bacilli emulsion.	Tuberculous and non-tuberculous persons.	In pulmonary tuberculosis 76.7 per cent of cases were positive. In surgical tuberculosis, not glands, 80.7 per cent positive. In proven cases of gland tuberculosis, 37.5 per cent positive. In less well-established cases smaller percentages. In controls there were no positive results except in lepra and Addison's disease. Syphilitics did not react. A positive reaction indicates active tuberculosis.
41. Radcliffe..... Ibid., 488.	.....do.....	.....do.....	.....do.....	.....do.....	Cases with T. B. in sputum. Turban classification: I. 88.6 per cent positive. II. 89.6 per cent positive. III. 79.3 per cent positive. Controls negative. In suspected cases a positive finding is of value in diagnosis.
42. Dudgeon..... Jour. Hyg., 1914, XIV, no. 1, 52.	3 units of amboceptor..	Sheep cells; guinea pig complement.	Alcoholic extract of tubercle bacilli, and various other antigens.	Experimental animals.	Rabbits treated with killed T. B. developed strong antibodies, but while still retaining them, succumbed to virulent tuberculous infection quicker than controls did. Tubercle bacilli sensitized with serum did not evoke antibodies. Killed tubercle bacilli injected after virulent inoculation, reduced the antibodies. The best antigen is an alcoholic extract of living tubercle bacilli.
43. Dudgeon, Meek, and Weir. Ibid., 72	.....do.....	.....do.....	.....do.....	Tuberculous cases.....	In 234 cases of pulmonary tuberculosis, 89 per cent were positive, but some only on repeated examination. Of 33 cases of surgical tuberculosis 20 were positive and 13 negative. A negative reaction is of little value in diagnosis. Variations in the same patient are noted. Improvement of the patient with reduction of the antibodies is sometimes noted.
44. Meek..... Ibid., 76.	.....do.....	.....do.....	.....do.....	Pulmonary tuberculosis.	The greatest amount of antibody is found in severe cases with extensive lesions. Cases similar clinically may give very different reactions. No constant relation exists between acute exacerbations or improvement or retrogression and the antibody content of the serum.
45. Bronfenbrenner..... Arch. Int. Med., 1914, no. 6, 786. Also Zeit. f. Immunitatsfg., 1914, XXIII, 2, 221.	Resembling Noguchi's	Human cells.....	Besredka's egg medium antigen.	Human tuberculosis and great variety of other diseases.	In active tuberculosis 93.84 per cent of cases gave a positive reaction. Besredka's antigen is specific. Syphilitic and tuberculous antibodies occurring in the same patient's serum are distinct and separable. 43 per cent of syphilitics gave a positive reaction with Besredka's antigen, indicating an undue pervalence of tuberculosis in this class of patients.

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In considering the trend of the work here tabulated, interest must center chiefly around the antigens employed. We are not justified in assuming that because an antigen gives positive fixation in a comparatively small proportion of established cases of tuberculosis it is necessarily valueless. Such an antigen might conceivably have the greatest value in prognosis. But, for the present, greater interest in the diagnostic possibilities of the test will be assumed. Here the antigen giving the greatest number of positive reactions in tuberculous cases, while at the same time giving negative reactions with other diseases and with normal subjects, will obviously be of the greatest value. Considered in this light and giving preponderance to those observations which have been confirmed by the largest numbers of workers, it appears that the claims for greatest diagnostic usefulness must be adjudged among three or four antigens. The most recent of these is Besredka's egg-medium antigen, and observers are unanimous thus far in finding that it gives positive reactions in a very high percentage of tuberculous cases, at least at certain stages of the disease. The objection has been adverted to by several authors that syphilitic antibodies were capable of causing fixation with this antigen, a circumstance which would, of course, impair its usefulness to a great degree. This luetic fixation has been attributed to the lipoid content of the antigen derived from the eggs used in making the medium. The researches of Bronfenbrenner are reassuring in this connection, and it is to be hoped that they will be confirmed in both their theoretical and practical aspects. It is possible that another objection may develop as other workers take up the use of this antigen, namely, difficulty in preparing the antigen. The description of its preparation given by Besredka is lacking in definiteness, and attempts by my assistants in this laboratory to duplicate his product have not been successful. I believe that thus far the work with this antigen reported by various observers has been done, like my own, with antigen supplied through the courtesy of Dr. Besredka.

Next in order must be considered antigens composed of suspensions of tubercle bacilli in salt solution. A fair number of observers have had favorable results with antigens of this class, using both killed and living tubercle bacilli, and have found, moreover, a high degree of specificity, except in veterinary work, where other acid-fast infections may cause confusion. Luetic fixation with these antigens does not appear to enter in as an objection. Their use is more troublesome than that of Besredka antigen, since the suspensions must frequently be made up fresh and standardized.

The antigens elaborated by Calmette and his coworkers, taken collectively, and the peptone-soluble antigen by itself, make serious claim for consideration; for not only was that author able to secure fixation in 92 per cent of cases using all three antigens, but another

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worker (24) obtained an equally high percentage of positives with the peptone antigen alone. Moreover, some prognostic significance was attached to variations in the activity of the sera with the different antigens.

Unfortunately, not all authors have described their antigens in sufficient detail. Some of the most promising results have been reported from the use of antigens briefly described as alcohol or alcohol-ether extracts. Another antigen which has some promise—from an experimental standpoint, at least—is that prepared by precipitation with alcohol from suspensions of tubercle bacilli, after the method of Besredka as modified by Gay and others.

The antigens which were so much used in the early work, old tuberculin, commercial "Bacillen emulsionen," extracts of tuberculous tissues, and various watery extracts, have failed in the hands of most workers to give hopeful results as diagnostic aids.

The so-called split products of the tubercle bacillus, the fats, fatty acids, proteins, "toxins," etc., which have been derived by physical and chemical means, have thus far had no successful application to the diagnostics of tuberculosis. Much, who with his students has written most extensively on these substances in connection with tuberculosis, does not detail his methods, but from the fact that he reports fixation in a large majority of the clinically nontuberculous, with tuberculin and tubercle bacilli emulsions, one is led to infer that his methods differ so radically from those commonly employed that comparison is impracticable. It is also a question whether by "splitting off" the substances we do not reduce them below the state of combination where they have any essential relation to the tubercle bacillus.

Considering next the methods employed by the various observers, it is noted that the Wasserman type of technic has been most extensively employed, with the use of sheep cells, rabbit hemolytic amboceptor, and guinea-pig complement. In a few instances ox or goat corpuscles have been used, and in one the native antisheep amboceptor of human serum has been removed. The original Bordet-Gengou technic has had several adherents, and one observer has employed a technic resembling that of Noguchi for syphilis. Special technics have been devised by several of the authors in attempts to solve peculiar problems—as, for example, that of the supposed thermolability of certain antibodies. A discussion of technical considerations will be given later. Suffice it to remark that the greater proportion of the work in the last few years appears to have been performed with understanding of basic principles and to be at least as worthy of confidence as a similar amount of syphilitic fixation work.

Most of this work has been primarily addressed to the practical application of the tests to human tuberculosis, a number of workers

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have been interested particularly in the application of the method to the detection of cattle tuberculosis, and another group have endeavored by animal experimentation to illuminate the essentials of the serological processes. Special reference must be made to the work of Debre and Paraf and others who have attempted to demonstrate tuberculous *antigens* for diagnostic purposes in such pathological fluids as urine and milk, using as a test fluid a serum known to contain tuberculous antibodies. This work, while of promise, especially in the diagnosis of genito-urinary tuberculosis, has not proceeded far enough for definite evaluation. An attempt to summarize the other work, especially as regards its practical application to diagnosis and prognosis in human tuberculosis, will be found in the general conclusions at the end of the article.

Original work.—The *serum* examined has come from patients in a tuberculosis sanatorium at a long distance from the laboratory; from a tuberculosis hospital convenient to the laboratory; from healthy persons exhibiting no evidence and giving no history of tuberculous infection; and from subjects of an industrial-hygiene investigation. The specimens were obtained in all cases by excellent technic from an arm vein, were adequate in amount, and showed no evidence of deterioration on inspection at the time of examination. Except where otherwise stated the serum was inactivated for 30 minutes at 55° C.

The technic employed closely follows the Wassermann. Sheep *corpuscles* were used. After repeated washings in large bulks of saline they were made up to the original bulk of the defibrinated blood from which they were derived, and a 5 per cent suspension of this was used. This suspension included also 1 unit of hemolytic amboceptor per c. c., the cells being thus sensitized before application to the test. The unit of *amboceptor* was constant and so chosen after several preliminary tests of the hemolytic system that its reinforcement by at least an equal amount of native amboceptor would be unlikely to increase the hemolysis, on the one hand, or enter on the Neisser-Wechsberg phase,[1] on the other. In other words, it was selected from the relatively flat portion of the hemolysis curve. The same supply of hemolytic serum was used throughout the series, and, since it was a relatively stable and potent specimen, deterioration was slow and negligible in extent. *Complement* was that of guinea-pig serum. In much of the work it was preserved by salting, being restored to normal tonicity before use by the addition of correct amounts of water, further dilutions being made with saline. The unit of each specimen was determined by titration before each test

[1] With constant amounts of complement and cells increasing amounts of amboceptor cause increasing degrees of hemolysis up to a certain point, beyond which excess of amboceptor "deviates" complement, and hemolysis is lessened.

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and varied from 0.03 to 0.05 c. c. of the undiluted serum. Two units were used in the tests.

It was, unfortunately, impossible to test all of the sera against all of the *antigens* which were used during the course of the work. The antigens used were: (1) Calmette's peptone-soluble endobacillary antigen, prepared at the laboratory from both fresh and dried human tubercle bacilli by heating 1 part by weight of bacilli after thorough trituration with 20 parts of 10 per cent peptone solution at 65° C. for 48 hours and filtering through a Berkefeld; (2) suspensions of human tubercle bacilli, both living and killed by heat, made by simple trituration in salt solution; (3) Besredka's egg medium antigen, kindly furnished by Dr. Besredka; (4) an antigen prepared by precipitating a suspension of living tubercle bacilli in salt solution with an equal bulk of absolute alcohol, sedimenting, decanting, drying the residue over H_2SO_4 *in vacuo*, pulverizing together with sufficient NaCl, so that when the emulsion resulting from trituration with water contained 1 per cent of the bacterial powder, the salt solution would be of physiological concentration. These antigens were all titrated before making tests, and the unit adopted for each test did not exceed one-half of the maximum nonself-binding dose.

The methods of handling these reagents involved careful measurements of all ingredients with graduated pipettes; a total bulk, made up with saline, of 3 c. c. for the first-phase incubation and of 4 c. c. for the second; incubation in water bath at 37° for 1 hour for the first phase, and the same supplemented by standing in the cold room over night for the second; controls of double amounts of the serum and of the antigens; and controls on the hemolytic system and corpuscle suspension. Instead of expressing the results by the usual methods of ++++, +, −, etc., or in terms like "strong positive," "weak positive," etc., readings were made of the tube contents on a colorimeter, using the hemolytic system control tube as the 100 per cent standard. The amount of fixation was taken as being 100 minus the reading for the tube contents considered. This method, although not giving a strictly proportionate measure, has the advantage of permitting the striking of averages for groups of tests for comparative purposes. As experience with these tests was gained the impression developed that 20 per cent or more of fixation in well-controlled, careful tests was certainly of significance but that below this experimental error might be operative. Eighty per cent fixation would be called a strong positive or 4+ by the majority of observers. Several authors have mentioned that the antibodies in tuberculosis are not as strong as in syphilis and that consequently the reactions are not as definite. While this is possibly true, one nevertheless frequently sees as sharp and positive results as could be desired.

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As regards the different technical procedures, judgment must be withheld as to which is the best and what one of the present ones, if any, is suitable for adoption as the standard. For the present it seems better that each worker should employ the method in which he has the most experience, provided that certain fundamentals are observed. These I should briefly summarize as the sacrifice of ease and speed to thoroughness and reliability; accurate measurements; controls sufficient to detect spurious evidences of fixation, especially those due to summation of anticomplementary effects; the use of at least two complement units to avoid the results of the deterioration of diluted complement at water-bath temperature; the avoidance of too great discrepancies between the total bulk in the first and second phase incubations. The criticism of the use of sheep cells on the ground of their being subject to the action of native amboceptor in human serum is not altogether well founded. It is granted that a fair proportion of human sera have this amboceptor, but these same sera may give excellent fixation, because if the complement has been fixed in the first phase, the mere increment of amboceptor will not cause hemolysis in the second. In fact it is quite possible that this reinforcement of hemolytic amboceptor may in certain quantitative relations reduce the hemolysis through the operation of the Neisser-Wechsberg phenomenon, and give a spurious appearance of fixation, a contingency which has not been sufficiently emphasized. However, I believe that the positive results in a series of tests will be somewhat increased by the use of human cells, or by removing the native antisheep amboceptor from the human serum.

The results of examination of 72 sanatorium patients is given in Table I. Of these, 37 had received no specific treatment, 21 had been treated for a considerable time with a watery extract of tubercle bacilli, and 14 had been treated with a so-called vaccine of avirulent acid-fast bacilli. It is realized that the numbers are too small in some of the groups to warrant any conclusions as to the significance of the figures, but considering the groups having eight or more cases, it would appear that the positive results with peptone extract reach their maximum in the moderately advanced stage, being reduced in the far advanced and very significantly small in arrested or cured cases. With the suspension of killed bacilli the maximum would appear, as Calmette states, to be deferred to the later stages. From this table it appears that the administration of the specific treatment referred to, resulted in a somewhat higher percentage, and greater intensity of positive reactions. In this connection the results given in Table II become of interest.

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TABLE I.—*Summary of fixation reactions in the first series.*

[Serum sent from a distance, several days old when examined.]

Class of cases.	Sanatorium treatment only.		Treated with a watery extract of tubercle bacilli.		Treated with a vaccine of avirulent acid-fasts.	
	Antigens.		Antigens.		Antigens.	
	Peptone extract tubercle bacilli.	Suspension-killed tubercle bacilli.	Peptone extract tubercle bacilli.	Suspension-killed tubercle bacilli.	Peptone extract tubercle bacilli.	Suspension-killed tubercle bacilli.
Far-advanced cases:						
Number examined	20	16	18	11	13	10
Average fixation	36%	21%	53%	34%	44%	35%
Cases in group giving 20 per cent or more fixation	50%	37%	83%	45%	54%	50%
Moderately advanced cases:						
Number examined	8	4	2	1	1	1
Average fixation	45%	2%	75%	75%	53%	3%
Cases in group giving 20 per cent or more fixation	63%	0%	100%	50%	100%	0%
Incipient cases:						
Number examined	1	1	1	1	0	0
Fixation	13%	2%	51%	0%	.....	.....
Cases in group giving 20 per cent or more fixation	0%	0%	100%	0%	.....	.....
Arrested or cured cases:						
Number examined	8	7	0	0	0	0
Average fixation	11%	2%	.....	.....	.....	.....
Cases in group giving 20 per cent or more fixation	13%	0%	.....	.....	.....	.....

NOTE.—In this and subsequent tables the words "average fixation" mean the arithmetic average of the fixations shown by all the sera in the group considered. The fixation shown by a serum is 100 per cent minus the percentage of hemolysis in the tube determined by calorimetric comparison with a completely hemolyzed control tube.

In Table II are shown the results as regards the clinical progress of the patients from six months to a year after the taking of the specimens reported in Table I. It should be remarked that at the institution in question (the Public Health Service sanatorium at Fort Stanton, N. Mex.) the manner of taking and recording physical examinations is rigorous and the determinations are as reliable as the nature of the case permits.

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TABLE II.—*Clinical results in 68 patients whose serum examinations are summarized in Table I, 6 to 12 months after examination.*

(Peptone extract antigen.)

Condition of patient.	Sanatorium treatment.		Watery extract treatment.		Avirulent vaccine treatment.		Total group.
	Number of cases.	Group.	Number of cases.	Group.	Number of cases.	Group.	
Gave fixation 20 per cent or more:		*Per cent.*		*Per cent.*		*Per cent.*	*Per cent.*
Same	4	33.3	5	27.7	3	37.5	31.6
Better	4	33.3	4	22.2	2	25.0	26.3
		66.6		49.9		62.5	57.9
Worse	3	25.0	7	38.8	3	37.5	34.2
Died	1	8.3	2	11.1	0	0.0	7.9
		33.3		49.9		37.5	42.1
		99.9		99.8		100.0	100.0
No fixation, i. e., under 20 per cent:							
Same	8	36.3	1	33.3	0	0.0	33.4
Better	7	31.8	1	33.3	0	0.0	23.3
		68.1		66.6		0.0	56.7
Worse	3	13.6	1	33.3	1	20.0	16.6
Died	4	18.1	0	0.0	4	80.0	26.6
		31.7		33.3		100.0	43.2
		99.8		99.9		100.0	99.9

The most significant finding indicated in this table is that although, as shown in Table I, a greater proportion of persons specifically treated with the preparations named had complement-fixing bodies in their serum, the subsequent course of their disease did not show that this was of any advantage to them. In fact, the evidence is rather that patients who responded to the stimulus of these preparations by the production of antibodies detected by this antigen, progressed less favorably than those who failed to respond and those who did not receive the injections. That no significant difference among the sanatorium cases is apparent, depending upon whether they had or had not shown antibodies, may perhaps be explained by a balancing action of the hopeless and of the arrested cases which, although representing opposite extremes from a clinical standpoint, still give on the average the same reaction, namely, a negative one. That this is so is indicated by the following figures, which give the average percentage of fixation for the various groups in the sanatorium cases of the above table:

Condition.	Same.	Better.	Worse.	Died.
Average fixation of group, per cent	18.7	26.1	41.1	14.6

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The "Same" group has a low index for the reason that it includes the arrested cases in which retrogression did not, and marked improvement could not, occur. Eliminating these cases and averaging the active cases which remain the index for this group becomes 26.9 per cent.

It is evident, therefore, that the significance of the reaction as regards prognosis depends on the associated clinical findings. In the active but as yet indecisive period of the battle between patient and disease, a positive reaction is rather of bad than of favorable import. One might assume from it that the patient would be worse before he would be better. A negative reaction with failing powers of the patient is almost confirmatory of the fact that the battle has been lost, while negative reactions associated with clinical improvement are hopeful harbingers of an arrest or cure. While no such definite conclusions could be drawn from a single test in an individual patient, nevertheless the above seems to be the general trend of the prognostic import of the reaction as indicated by this series, with Calmette's peptone-soluble antigen.

Another group of sanatorium cases in which the serum was examined shortly after it was secured, by reason of the convenience to the laboratory, gave no greater incidence of positive reactions than the one just reported. Of 27 patients but 11 showed significant fixation with the peptone-soluble antigen (40.7 per cent). These cases were for the most part far advanced, and it is probable that many were beyond the stage when antibodies are to be expected. Comparing the results in this series with those in the former one, it may be inferred that the antibodies demonstrated by this antigen are not so labile as to be destroyed by the conditions of transportation operating for several days.

In a third group from this same institution there is opportunity for comparing the action of different antigens. In all, 47 cases are represented. Classifying these so that the comparisons of antigens are referable to the same sera the results may be thus tabulated:

TABLE III.—*Comparison of results with three antigens on the same sera from tuberculous cases.*

(No specific treatment.)

Number of sera for comparison.	Suspension of living tubercle bacilli.		Calmette's peptone antigen.		Alcoholic precipitate antigen.	
	Fixation in—	Average fixation.	Fixation in—	Average fixation.	Fixation in—	Average fixation.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
18	66.6	44.0	72.2	27.9	.....	.....
12	66.6	44.1	75.0	33.3	58.3	43.1
33	.....	.....	55.8	27.3	55.8	39.0

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From these results it may be assumed that the Calmette peptone antigen gives a reaction in a greater proportion of well-developed cases such as these were, but that these reactions were less well marked than those with the other antigens. The other two antigens were approximately equivalent as regards the strength of the reaction given by them, but the suspension had somewhat the advantage in the number of cases giving a positive reaction.

Tables IV and V represent still another group of cases from the near-by institution, and indicate that the antigens used reach their maximum proportion of positives in the second stage of pulmonary tuberculosis, and in patients who are progressing unfavorably, but that the reduction of this proportion in the last stage and in favorable cases is relatively greater in the case of the peptone antigen while the strength of the reaction given by the peptone antigen is in general inferior to that of the alcohol precipitate.

In all of these series controls consisting of the serum of one or more healthy persons not suspected of being tuberculous have been run with each test. In none of them has fixation ever been demonstrated.

TABLE IV.—*Comparison of results with two antigens in the three stages of pulmonary tuberculosis (Turban).*

(No specific treatment.)

	Stage I.		Stage II.		Stage III.	
	Peptone extract.	Alcohol precipitate.	Peptone extract.	Alcohol precipitate.	Peptone extract.	Alcohol precipitate.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Fixation in	43	25	66.6	57.8	36.3	50
Average fixation	23	18	32.5	45.2	12.5	38

TABLE V.—*Comparison of results with two antigens, according to whether at the time of examination the patient was progressing favorably or not.*

(No specific treatment.)

	Favorably.		Unfavorably.	
	Peptone extract.	Alcohol precipitate.	Peptone extract.	Alcohol precipitate.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Fixation in	31.2	38.4	62.5	46.1
Average fixation	19.0	32.5	28.2	30.1

In addition tests were made with the peptone antigen and Besredka's egg medium antigen upon 52 sera from the subjects of an investigation into the physical condition of workers in the garment industries in New York. The subjects were mostly those in whom a

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history of cough or of loss of weight or the general appearance had suggested the possibility of tuberculous infection, although definite symptoms and signs were lacking. In two of these cases fixation was obtained with Besredka's antigen, and in one with the peptone antigen. The patient giving fixation with both antigens had definite signs and symptoms of pulmonary tuberculosis. The patient giving fixation only with the Besredka antigen was a frank case of secondary syphilis.

It has been suggested by several authors that some, at least, of the tuberculous antibodies were thermolabile, and consequently escaped detection in the ordinary tests with inactivated serum. I made some tests to determine this, using a method much like that of Zweig (13). Two series of tubes were set up, each containing the active serum in decreasing amounts. To one of the series was added a dose of antigen, the same amount for each tube. After bringing the volume up to a uniform amount with saline, and incubating for an hour, sensitized cells were added. The series without antigen was virtually a test for complement in the serum, and by comparing the hemolysis in the tubes of this series with that of corresponding tubes in the series with antigen, the occurrence and degree of fixation could be determined. Due to fluctuations in the amount of complement in different sera, the maximum amount of fixation occurred with varying amounts of serum, so that there was no basis for comparison of the antibody strength, except to accept this maximum. These same sera were then inactivated and a test made in the usual way. Fukuhara,[1] has shown that peptone solutions will cause fixation with normal active serum, although not with inactivated serum. It was not surprising, therefore, that with the peptone extract some fixation was shown in all the active sera examined, including the normal controls. The other antigens (tubercle bacilli suspension, and alcohol precipitate) appeared to be more specific, giving only minimum amounts of fixation with normal sera. Comparisons of the results with active and inactivated serum in 21 cases showed in general a very significant reduction of antibody strength as indicated by the peptone extract tests, but with the other antigens there were but three significant discrepancies—two cases in which the reaction was negative in the inactivated serum while positive in the active, and one in which the converse occurred, which was readily accounted for by the absence of complement from this specimen of uninactivated serum. The antibodies of tuberculosis (reacting to these antigens) are therefore quantitatively reduced by heating, as indeed are those of syphilis, and it is quite possible that when present in the active serum in small quantity they may be reduced by heating below the point of definite determination.

[1] Fukuhara. Zeit. f. Immunitätsforschung, vol. 12, 1911, p. 183.

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The question of the artificial stimulation of antibodies is important. There can be no doubt that by the injection of certain products of the tubercle bacillus the formation of antibodies which will fix complement with some at least of the tuberculous antigens can be induced or increased. It is not demonstrated, however, that this artificial increase is desirable from the standpoint of improving the condition of the patient. Neither is it demonstrated that the presence of antibodies is an indication of established immunity. In fact, we do not find these antibodies in the serum of healthy persons who have reached middle age without developing recognizable tuberculous infections, and who therefore may be assumed to possess at least a relative immunity or high resistance. Again, the evidence is strong that after recovery from tuberculosis the antibody content of the serum tends to diminish and disappear. Since of all the forms of acquired immunity the strongest and most permanent is assumed to be that afforded by an actual attack of the disease in question followed by recovery, it would seem that in the relative absence of antibodies from the serum of patients of this class we find a strong argument against their playing an important part in immunity, and against the assumption of improvement in the condition of the patient by their artificial production. It is apparent that antibodies do not check or reduce the *production* of the antigen liberated from a tuberculous focus. Their action takes place after its liberation, if indeed at all intra-vitam, and we are almost wholly in the dark as to what effect this fixation would have as regards the deleterious effects of the antigens upon the body. It could conceivably be harmful. We do know that patients with fever and the other manifestations of toxemia may yet show strong complement-fixing bodies in their serum. In this connection an experiment which I performed may be of interest. Five active sera were tested against a suspension of *living* tubercle bacilli as antigen. Three of these gave strong fixation and two a negligible degree, one of the latter being from a clinically normal person and all the rest from tuberculous persons. The tube contents were then injected into guinea pigs with results as shown:

Serum from—	Fixation.	Pig died in—	Findings.
	Per cent.	*Days.*	
Tuberculous case	82	35	Tuberculosis of lymph nodes, spleen, and liver.
Do	98	55	Tuberculosis of lymph nodes, spleen, liver, and lungs.
Do	87	62	Do.
Do	10	66	Do.
Normal person	8	67	Do.

While an isolated experiment of this kind has no conclusive significance, the evidence, as far as it goes, is that the presence of complement-fixing bodies is not necessarily associated with an effect on tubercle bacilli in the direction of reducing their virulence, or toxic

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effects. In fact the animals receiving the tube contents in which fixation had occurred all died earlier than those in which no, or little, fixation was shown. Baldwin has found that animals inoculated with tubercle bacilli which have been exposed to the action of serum containing antibodies, succumb quicker than those injected with bacilli acted upon by normal serum. This fact he was inclined to ascribe to the agglutinins which accompany the other antibodies, and which by clumping the bacilli render them less susceptible to phagocytosis.

I may perhaps illustrate the difficulties of ascribing the proper rôle to complement-fixing antibodies in tuberculosis by drawing a parallel with a very different disease, namely, furunculosis. Many persons in spite of exposure do not have furunculosis. They are immune. Others are continually suffering from the disease. In them the introduction of the causative cocci is followed by heat, redness, swelling, suppuration. How shall we describe this inflammatory reaction? We can not call it an immune reaction—immune persons do not have it. If we call it a defensive reaction we must admit that as long as it persists the result is dubious, and that meanwhile the patient suffers. We are at least safe in calling it a reaction and thereby we imply the activity of the invader. So in tuberculosis, the antibodies do not imply immunity; if they are present they indicate a doubtful battle, during which the patient suffers, and we should remain more closely within the bounds of our knowledge if we described them as reaction bodies rather than as immune bodies, protective bodies, or even as antibodies.

The finding of complement fixation in a tuberculous patient appears to be dependent upon the interplay of two, and possibly three, fundamental factors. First, the *antigens* liberated in the body as a result of invasion of the tubercle bacillus. The exact nature of these is still unknown. They may conceivably consist of the bacillus itself, of products of the disintegration of the bacillus, of endotoxins, or of products of the disintegration of the tissues evolved during the tuberculous process. We must remember also the antigens which may be artificially introduced. Second, the *antibodies*, which may be produced in response to the stimulus exerted by these antigens. Third, we must consider the rôle possibly played by the *inhibiting substances* which are stated by observers, notably Calmette and his coworkers, and Caulfield, to occur in certain tuberculous sera, and which have the effect of producing negative reactions in sera which contain antibodies. The interaction of these factors in various quantitative relations may give rise to various hypothetical contingencies in the test reactions of a serum, the most important of which appear to be the following:

Case 1.—No antigen is or has been present in the body, therefore we get a negative reaction since there is also no antibody.

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Case 2.—Antigen is present but for some reason there is no antibody formation—negative reaction.

Case 3.—Antigen is present, but the antibody is quantitatively insufficient to more than saturate the antigen; it therefore remains undetected, and the reaction is negative.

Case 4.—Antigen and antibody are present, the latter in such excess that it can be detected, and a positive reaction results.

Case 5.—Both are present, but there is also an inhibiting substance which interferes with the reaction of fixation, which therefore results negatively.

Case 6.—The antigen formerly present has disappeared and no more is being liberated, but the antibody evoked by it still remains, being demonstrable in decreasing amounts on successive examinations.

Considered in the light of these hypothetical possibilities the observed discrepancies in the results of examining a series of patients become more reasonable, and susceptible of interpretation.

Cases 2, 3, and 5 are those in which confusing disagreement between the serum and clinical findings would be expected. In case 2 the presence of antigen means that there is active tuberculosis. Certain individuals and certain experimental animals are unable because of some physiological peculiarity to respond to the stimulus of antigen by the production of antibodies. Human tuberculous cases in this category will not be detected by complement-fixation tests unless these tests are developed in the direction of demonstrating circulating antigen rather than antibody. In the same case are those patients in advanced stages with lost "resistance" and also lost reactive ability, but here the clinical picture will be sufficiently distinct to prevent confusion as to the real condition. Under case 3 would come those cases of moderately advanced tuberculosis in which, owing to an even balancing of antigen and antibody, neither would be demonstrable in vitro in case we assume intra vitam fixation of complement. In this class of cases repeated tests might be valuable. In case 5 the operation of inhibiting bodies is assumed. Calmette and his coworkers have devoted their attention principally to devising means of avoiding the operation of these bodies in tests—of detecting antibody despite their presence. My own attempts to remove supposed inhibiting bodies from the serum of active cases which failed to show fixation, by the method used by these authors (dilution, heating, passing through CO_2 gas and restoring tonicity) have been but partially confirmatory, although they have as yet been too few to be conclusive. I have not thus far been able to convince myself that the changes produced by this treatment of serum are related to specific fixation, since I have seen such treatment result in the *appearance* of fixation in the serum of persons not having any suspicion of active tuberculosis.

Caulfield, on the other hand, instead of attempting to avoid the obscuring effect on antibodies of these inhibiting bodies, has found significance in their presence. In a general way they seem to be of

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favorable import, while the complement fixation is indicative of a dubious or stormy course of the disease with many ups and downs. Both observers are at one in attributing the action of the inhibiting bodies to their influence upon the antigen. These bodies are selective as regards the particular antigens which they affect. That they do not operate upon all antigens is shown by the fact that observers are obtaining positive reactions of fixation in over 90 per cent of cases of tuberculosis with certain antigens.

In summing up the present status of complement fixation tests in relation to tuberculosis as indicated by a review of the recent literature and in the light of my own work, the following generalizations appear to be justified. Depending upon the antigen and the technic employed, the proportion of tuberculous cases in which positive fixation will be demonstrated will vary from a maximum of some 95 per cent down to a much lower figure. While those antigens and technics giving the higher percentages of positive results are more valuable in confirming suspected and detecting unsuspected cases, they tend to approach such tests as that of von Pirquet in failing to afford much information as to the stage, extent, and activity of the tuberculous process. Nevertheless, the continued presence of reactive bodies in the serum of a given patient on repeated examination is, I believe, strong presumptive evidence of continued or recent activity of the lesions, when no antigens have been artificially administered.

Those antigens and technics affording a smaller percentage of positive reactions may still be valuable in confirming clinical observations as to the activity of the disease. Repeated observations would appear to have particular value in this connection. Thus in a patient who from a clinical standpoint had reached the condition of arrest or cure, repeated negative reactions would be confirmatory, while as long as positive results cropped up we should be justified in suspecting continued activity and expecting perturbations. Only in the terminal stages does a negative reaction have sinister import, and here it may be regarded as part of the general loss of vital reactivity. Positive reactions are not indicative of immunity and the reaction should not be described as an immune reaction. The artificial increase of complement-fixing bodies by the therapeutic administration of products derived from the tubercle bacillus can not be assumed to indicate improvement in the condition of the patient. That it may prove to have such significance in the case of certain products can not be denied, but proof must be demanded in each case. It appears from my own work that the administration of certain products derived from the tubercle bacillus may result in the increase of complement-fixing bodies, but that this is not necessarily associated with improvement in the condition of the patient—in fact, the evidence is rather in the opposite direction.

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The complement-fixation reaction with inactivated serum and with the antigens now more generally employed appears to be highly specific. Inasmuch as a number of recent workers have obtained high percentages of positive results with Besredka's new antigen, it is likely that this preparation will be the subject of considerable investigation in the near future. If Bronfenbrenner's conception of the nonlipotropic nature of the reaction of syphilitic serum with this antigen proves to be correct (and his opinion appears to be well grounded), one objection to the employment of the latter will be removed. At the same time serological support will be given to the idea that syphilis greatly predisposes to tuberculous infection, and the venereal disease will assume even greater importance from a public health standpoint.

It is difficult to forecast the rôle which complement fixation tests are destined to play as applied to practical tuberculosis work. Now that work along these lines is tending toward greater unanimity, and we are able to summarize the significance of a positive result as reactive power against recently liberated antigen, some promise is given that tests of this nature may become valuable aids in the diagnosis, prognosis, and management of tuberculous cases. Especially will this be the case when practicable methods are developed for estimating not only the antibody, but also the antigen content of serum, a phase of the subject which is already receiving attention.

In its present condition this test can be of little assistance to the private practitioner. In institutional practice, however, I believe that the introduction of these tests as a routine, parallel with the lues fixation tests, would be advantageous. This I believe because the tests are highly specific and because when positive they indicate present or at least recent activity. The fact that negative reactions have no value in excluding tuberculous infection must, however, be fully appreciated. In every large general hospital will be found cases in which physical examination has elicited obscure signs of tuberculous lesions, but in which, perhaps after a single negative sputum examination, no further attention has been paid to the tuberculous element. Some of these patients undoubtedly have active lesions, and yet the excellent opportunity afforded by the hospital conditions for salutary information, advice, and training is often lost, to the detriment of both the patient and the public. Any test therefore which will serve to emphasize the presence of tuberculous complications must ultimately be of benefit, even though it may not operate at all stages nor in every patient.

I desire to make grateful acknowledgment of the courtesy of Dr. W. D. Tewksbury, of the Washington Tuberculosis Hospital, and his assistants, and of Passed Asst. Surg. F. C. Smith, Public Health Service, in securing or permitting the taking of the specimens of serum examined in the original work here reported.

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II.—REPORT OF AN INVESTIGATION OF DIPHTHERIA CARRIERS.[1]

By JOSEPH GOLDBERGER, *Surgeon*, C. L. WILLIAMS, *Assistant Surgeon*, and F. W. HACHTEL, *Bacteriologist*, *United States Public Health Service*.

INTRODUCTION.

During the winter of 1913–14 an opportunity occurred for study of the distribution of diphtheria carriers among the population of the city of Detroit, Mich. This was undertaken as a part of an extensive investigation of diphtheria from a public-health standpoint. Unfortunately this work was interrupted by the detailing of both the senior writers of this report on epidemic duty. However, the investigation of carriers in Detroit forms a fairly complete unit, and we feel that the results are of sufficient importance to be presented at this time.

ACKNOWLEDGMENTS.

We are indebted to Asst. Surg. Joseph Bolten and Temporary Bacteriologist Aubrey Straus for valuable assistance in the examination of smears. It is also a pleasure to acknowledge the very helpful cooperation extended to us by Dr. W. H. Price, health officer of Detroit, and many courtesies shown by Dr. E. M. Houghton, director of the research laboratory of Parke, Davis & Co.

OBJECT.

For nearly a year prior to the commencement of this investigation diphtheria had been unusually prevalent in Detroit, and it was originally our object to determine the percentage of carriers present during a time when the disease was of frequent occurrence. This object was modified, however, due to the marked decrease in the number of cases and deaths about three weeks before starting the collection of cultures, so that it resolved itself into a determination of the percentage of diphtheria carriers in the population at large shortly after a time of greatly increased prevalence of the disease.

In reviewing the literature on the subject of diphtheria carriers one is struck by the fact that in most instances the subjects of examina-

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tion are inmates of institutions or are restricted to one or two particular classes of persons, as school children, medical students, patients at clinics, etc. The reason for this is probably the more ready accessibility and less expense involved when the examination is confined to members of more or less well-defined readily accessible groups. A fairly comprehensive survey of the literature has failed to show any previous study where the incidence of diphtheria carriers was determined by cultures taken indiscriminately from healthy persons of all classes in the community.

During the progress of this investigation opportunity was found for the following coincident studies:

1. Comparison of the relative values of cultures from different sources.
2. Tests of virulence and acid production.
3. Observations of Hoffman's bacillus.

LITERATURE.

We regret that the pressure of other duties has prevented the preparation of a résumé of the pertinent literature. The reader is referred to Nuttall and Graham Smith's excellent monograph, The Bacteriology of Diphtheria, and to the article by Neisser and Gins,[8] in Kolle & Wasserman's Handbook (2d ed.) for a complete bibliography.

COLLECTION OF CULTURES.

Our search for diphtheria carriers was inaugurated December 22, 1913, and concluded March 4, 1914. In that time a total of 4,093 apparently healthy persons and 95 persons suffering with clinical symptoms of diphtheria were examined. A total of 9,489 cultures were taken from these and examined.

In the hope of securing a representative portion of the population as a whole, a house-to-house visitation was carried out in representative sections of the city. In addition some cultures were taken from children visiting the daily clinics at the board of health, principally the dental clinic, and on a few occasions from children at school and workers in factories. In going from house to house, cultures were taken so far as possible from all persons found at home.

TABLE 1.—*Showing number of healthy persons examined, grouped according to age.*

	Age in years.										Unknown (adult females).
	0–1	2–5	6–10	11–15	16–25	26–35	36–50	51–65	66–80	80	
Number of persons in each group.....	158	510	599	673	699	633	450	176	82	3	110

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An attempt was made to get our cultures so distributed as to be representative of the age and sex distribution of the general population. Table 1 shows the age distribution of the healthy individuals cultured. As will be seen, we succeeded in part only since, as a matter of fact, we have a disproportionately large number of females and of children between the ages of 5 and 15 with consequently smaller numbers of males and persons over 15 years of age. Among the 4,093 apparently well persons examined there were 1,600, or 39 per cent, males, and 2,493, or 61 per cent, females. In the total population of the city of 465,776 (Census of 1910) there were 240,354, or 51.7 per cent, males, and 225,412, or 48.3 per cent, females. Among persons examined the age groups 0–5 years; 6–15 years, and 16 years and over constitute 16.3 per cent, 31 per cent, and 52.7 per cent, respectively, while among the total population these groups comprise 12.3 per cent, 16.4 per cent (approximately), and 71.3 per cent (approximately).

The occupations of the persons furnishing our cultures were in a general way as follows: School, 1,974; in business and various occupations mostly engaged in by men, 693; housework, 1,182; unknown or none, 244.

The cultures were made on Löffler's blood serum exclusively. This was prepared for us by Parke, Davis & Co., in whose excellently equipped laboratory our work while in Detroit was done, space for this purpose being rented from the firm. The medium was controlled at short intervals by cultures from clinical cases of diphtheria and test cultures of known B. diphtheriæ. It was found to support a good growth of this organism at all times.

Cultures were made from the throat, from the nose, or from both, in each case on a single slant. From some individuals only a single culture inoculated from the nose and throat was taken. From others three cultures were secured at one time; one from the throat, one from the nose, and the third from both nose and throat as above. When three cultures were taken at one time the procedure was to make the throat culture first and to reenter the throat with the same swab for material for the combination culture. Next the nose culture was made with a fresh swab, reentering both nostrils with the same swab for material to complete the combination culture previously inoculated with the throat swab. In this way only two swabs were necessary for making the three cultures. When only a single culture, inoculated from both the nose and throat, was made, two swabs were always used, one for the throat and the other for the nose.

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EXAMINATION OF CULTURES.

Cultures were made during the day between the hours of 9 a. m. and 5 p. m. They were taken to the laboratory and placed in the incubator at 5.30 p. m., and removed the next morning at 8.30, remaining in the incubator at 37° for 15 hours. The making of smears was commenced at 8.30 and finished as a rule by 10 a. m. The average number of smears per day was 158, much less at first, but rising to 300 or more toward the end of our work. Smears were stained with Löffler's alkaline methylene blue for 30 seconds and examined under oil immersion lens. Where doubtful organisms were encountered additional smears were made and stained with either Neisser (old) or Ljubinsky's stain, or both.

The routine procedure in the examination of smears was to view at least 30 fields before declaring a smear negative. At first every slide was examined by two persons, each keeping a separate record and comparing notes after all were examined. Discrepancies were checked by reexamination of the same or additional smears. When after examination of about 2,000 cultures the daily average was raised to 300, it was found impracticable for two men to see every slide, so that a system was adopted whereby the smears from the different cultures from each individual were examined by different workers. Thus, one man would see the nose smear, another the smear from the throat, etc. Whenever a positive smear was encountered by one man it was checked by one or more others, and the smears of the other cultures from the same individual were given additional scrutiny before considering them negative. However, in those instances where only a single culture was taken from an individual the smear was always examined by two persons. In doubtful cases the culture was reincubated and reexamined the next morning while coincident isolation of the suspicious organism was attempted, final decision being based on the results obtained with these procedures.

In order to standardize our method, Wesbrook's Types (1) were used as a criterion, only organisms corresponding to the A. C. D. and A′ or C′ types being declared positive, including, however, the "Sheath" type as described by Eyre (2). As has been noted by other workers, we found organisms that, strictly speaking, did not belong to any of these types. Atypical forms were classed with the types which they most closely resembled. In only four or five cases, however, was there any doubt as to the nature of the organisms not corresponding strictly to the types. In these instances reincubation of the culture or isolation of the organisms showed them to be, at least morphologically, not B. diphtheriae. As a help toward close

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observation, a note was made of the different forms of bacteria seen in each smear. Wesbrook's types were used to designate diphtheriod bacilli, types E^2 and D^2 being regarded as Hoffman's bacillus.

An attempt was invariably made to isolate the organisms that we recognized as morphologically diphtheria. For this purpose Löffler's serum media plates were used. A loopful of an emulsion of the culture in bouillon was streaked on a series of three plates. After 20 hours incubation colonies were picked and smears examined. In the search, at least 30 colonies were examined, if necessary. This method of isolation was not satisfactory when the organisms sought for were few in number in the original smear; in most of such cases the plates failed to show diphtheria colonies. In one or two cases where the organisms were numerous in the original smears they were lost in the plates, because of the presence of a "spreader" in the culture. When isolated, the culture was always replated in order to insure purity, two cultures, each representing a separate colony, being preserved for further study.

The routine procedure for the preservation of cultures was to grow them on serum at 37° until good growth was obtained, one to three days being required, and to keep thereafter in cold room at 15° C., transfers to fresh media at first being made every two weeks. This time was soon shortened to one week after three cultures from carriers had been lost through failure to grow on transplanting. After three months of this treatment most of the cultures were transferred to plain agar, kept at room temperature and replanted monthly. A few still required serum and fortnightly transfer for preservation; all of the latter proved nonvirulent. The same technique was used for the isolation and preservation of diphtheroids, including Hoffman's bacillus.

All cultures were taken to the Hygienic Laboratory, Washington, D. C., for virulence and acid-production tests.

FREQUENCY OF CARRIERS.

During the course of this investigation a total of 4,098 individuals, all apparently healthy, were examined. Two of these very shortly after cultures were taken developed mild clinical symptoms of diphtheria (sore throat, slight temperature, and general malaise) and gave positive virulent cultures; while three others, with positive cultures, gave definite history of contact with cases very suspicious of, or positive, for diphtheria. The culture from one of these, a contact with one of the mild cases cited above, was virulent; that from the second was nonvirulent; the third we failed to isolate. Excluding these five we have for consideration 4,093 apparently healthy indi-

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viduals without history of direct contact. These furnished us with a total of 8,758 cultures, as shown in Table 2:

TABLE 2.

Type of culture or cultures.	Number of individuals.	Total cultures of different types.		
		Nose.	Throat.	Combined.
Nose culture only	5	5		
Throat culture only	320		320	
Combined nose and throat only	1,422			1,422
A nose and a throat only	26	26	26	
A throat and a "combined" only	1		1	1
A nose, a throat, and a combined only	2,319	2,319	2,319	2,319
Total	4,093	2,350	2,666	3,742

These cultures showed a total of 38 carriers or about 1 (0.928) per cent of the population examined. Since these cultures were taken from a large number of individuals indiscriminately selected from the population at large in various parts of the city, the results obtained will probably serve as a fair index of the proportion of carriers among the whole population. They indicate that persons harboring organisms in the throat or nose morphologically identical with B. diphtheriae constituted about 1 per cent of the population of Detroit, or in other words, there were in that city about five to six thousand diphtheria bacilli carriers.

These results are low as compared with those obtained by the majority of other workers in this field. In reviewing the literature results above 2 per cent are more often found than results below this figure. In 1902 the committee of the Association of Massachusetts Boards of Health (4) reported on the examination of 3,096 healthy persons in the East among whom were found 43 carriers, or 1.39 per cent, and of 1,154 persons in Minnesota among whom were found 80 carriers, or 6.93 per cent. In 1907 von Sholly (5) reported on the examination of 1,000 persons, most of them children. Throat cultures only were taken. Among these 56 positives were found, or 5.6 per cent. The bacilli were all isolated in pure culture and tested for virulence, 18, or 1.8 per cent, of the persons examined being found virulent. In 1913 Moss (6) reported on the examination of 1,217 school children in Baltimore, Md., and of 1,290 inmates of faculty members' homes and students' boarding houses of Johns Hopkins University Medical School. Throat cultures only were taken. Among the school children were found 44 carriers, or 3.61 per cent. The organisms were isolated from 33 and tested for virulence, 6 being found virulent. In the other group of 1,290 persons were found 45 carriers, or 3.48 per cent. The examination of these latter persons

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seems to have been conducted at the time of an epidemic of diphtheria at the Johns Hopkins Medical School and Hospital, reported by Ford (7) in 1911.

Table 3, taken from Nuttall and Graham Smith (3), gives the findings of some other workers:

TABLE 3.—*Observations on prevalence of carriers.*

Observer.	Number nonexposed persons examined.	Persons harboring virulent bacillus diphtheriae.	Persons harboring nonvirulent bacillus diphtheriae
Parke & Beebe (1895)	274	2	23
Kober (1899)	588	0	3
Denny (1900)	235	0	1
Cobbett (1901)	43	0	0
Cobbett (unpublished)	90	0	0
Pugh (1902)	415	0	17
Graham Smith (1903)	362	0	1
Pennington (1907)	125	2	11
Total	2,132	[1] 4	[2] 56

[1] 0.18 per cent. [2] 2.62 per cent.

RELATIVE VALUE OF DIFFERENT TYPES OF CULTURE.

The question of how many and what cultures to take in searching for the bacillus diphtheriae for purposes of "release" from quarantine or in the search for carriers is one of considerable importance. The increase in expense and trouble in taking multiple cultures is a decided argument against this procedure, and one sufficient to justify the use of any single culture that in practice will give an approximation to the ideal. Having this consideration in mind we planned our work with a view of obtaining data that might be helpful in estimating the relative value of different types of culture. In Table 4 we give a statement of the number of the different types of cultures furnished by the 4,093 individuals studied and also the number of carriers disclosed by each method of culture. This shows at a glance the relative value of each.

TABLE 4.

Type of culture.	Number of cultures.	Total number of individuals furnishing cultures.	Number of carriers.	Per cent carriers.
Throat	2,666	2,666	14	0.525
Nose	2,350	2,350	16	.680
Combined nose and throat	3,742	3,742	26	.694
2 cultures, 1 from nose and 1 from throat	4,690	2,345	24	1.023
3 cultures, 1 from nose, 1 from throat, and 1 from both throat and nose	6,957	2,319	26	1.121

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The low rate from the throat culture is of obvious import. This is the culture most commonly taken in board of health work, and it is evident that if it is used alone a considerable percentage of carriers will be missed. The slightly higher result obtained by the use of a single combined nose and throat culture and decidedly higher result obtained by employing two cultures, one from the throat and the other from the nose, suggests the greater value of these methods for detecting the presence of carriers. The combined result of the three simultaneous cultures, as might be expected, shows the greatest percentage of positives, but the lead over separate nose and throat cultures considered together is slight and is evidently due to the greater chance of striking the organisms sought for when the larger number of cultures is taken.

It would appear that in a search for carriers (or contacts) where the taking of a single culture only from each person is practicable the combined throat and nose culture should be used. Its use requires a comparatively slight increase of expense over single throat or single nose cultures, a double quantity of swabs being necessary. Where more than one culture from each individual is practicable, from the standpoint of cost and laboratory facilities, separate throat and nose cultures should be made. All extra cultures besides these two increase the chance of getting positive results where the bacilli sought for are few in number.

Data similar to the foregoing in regard to cultures from clinical cases were obtained by taking from each of a number of such cases one nose culture, one throat culture, and one "combined" culture at the same time. Positive results were obtained in one or more of the three cultures from each of 42 cases. Comparing the results from different cultures, we find that of the 42 throat cultures, 34, or 80.1 per cent, were positive; of the 42 nose cultures, 21, or 50 per cent, were positive; and of the 42 combined cultures, 32, or 76.2 per cent, were positive.

Further examination of the results shows that in 18 cases the throat culture was positive while the nose culture was negative, while in only 5 cases was the reverse true. In 3 cases only the "combined" culture was positive, while the throat culture and the nose culture were both negative. These results indicate that no single culture in clinical cases gives 100 per cent results but that, as might be anticipated, a throat culture comes nearer to this than any other single culture.

VIRULENCE TESTS.

Technique.—Virulence tests of cultures isolated were made as follows: The two strains of each culture were planted in Smith's sugar-free bouillon and transferred through five generations or more, until a good growth was obtained in 24 hours. Daily transfer was

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made when there was good growth, but when the growth was poor transfers were made at 48 or even 72 hour intervals until organisms were sufficiently habituated to allow daily transplants. Ordinary culture tubes were used to contain the bouillon and were slanted in the incubator to allow more surface exposure of the media. When good growth was obtained 2 c. c. of a 72-hour culture were injected beneath the skin of the belly wall of a 250-gram guinea pig. If the guinea pig remained alive 10 days or more and no paralysis developed within four weeks, the organism was considered nonvirulent. All animals dying were autopsied, and if signs of diphtheria were not found the inoculation was repeated. None of our cultures, other than those proving virulent, caused the death of any animals on repeating the test, though in the first test the injection of two of what proved to be nonvirulent cultures was followed by death within six days without, however, causing any appreciable macroscopic lesions of diphtheria. None of our animals developed paralysis. When an animal died within 10 days with signs of diphtheria at autopsy, a set of three guinea pigs, 250 grams weight, were next inoculated with 1 c. c., 0.1 c. c., and 0.01 c. c., respectively, of a seven days' culture of the same organism. Under these conditions all of the cultures that we considered virulent killed within six days in 1 c. c. and 0.1 c. c. doses. None of them killed in 0.01 c. c. dose. A final test was made by inoculating one guinea pig with 0.2 c. c. of a seven days' culture, that is, twice the fatal dose, while a control received 2 c. c., 20 times the fatal dose plus 250 units of antitoxin. For a positive result it was required that the unprotected animal die within six days with signs of diphtheria, while protected animals survived. In all cases the amount of fluid injected was 2 to 2½ c. c., salt solution 0.9 per cent being used as a diluent.

Results.—We isolated the organism in pure culture from 19 of our 38 carrier cases, an even 50 per cent. All of these were tested and 2 found virulent. On this basis it may be assumed that 4 of our 38 carriers harbored virulent bacilli. This would give a ratio of 4 in 4,093 persons, or 0.097 per cent who were carriers of virulent bacilli. This result is somewhat lower than the rate compiled by Graham-Smith and shown in Table 2, namely, 0.18 per cent.

It is interesting to note that our two carriers with virulent culture were school girls, 7 and 11 years of age, respectively.

ACID PRODUCTION.

Technique.—All of the cultures isolated were tested for acid production. The organisms were planted on sugar-free bouillon to which had been added 1 per cent dextrose, instead of the 0.1 per cent used for toxin production. These cultures were allowed to grow for eight days, and then titrated against N/20 sodium hydrate. Nearly all of

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the cultures grew well in this medium without education; a few had to be educated by transfer every other day through three or four generations.

The cultures were titrated according to the standard methods for titrating media. The cultures were always planted in a media with a reaction of +0.5. Two blank tubes of the same media were incubated with every set of cultures and titrated along with them in order to determine the increase of acidity due to evaporation, etc.

Results.—All cultures isolated from carriers were tested for acid production with results as shown in Tables 5 and 6.

TABLE 5.—*Showing results of test for acid production by 2 virulent cultures from carriers, 2 strains of each culture being tested.*

(Result after 8 days' incubation.)

Culture No.	Reaction.		Net increase acidity.	Culture No.	Reaction.		Net increase acidity.
	Culture.	Blank.			Culture.	Blank.	
4149	+5.2	+1.1	4.1	7646	+5.7	+1.1	4.6
4149a	+4.8	+1.1	3.7	7646a	+5.7	+1.1	4.6

TABLE 6.—*Showing results of acid production by 17 nonvirulent cultures morphologically diphtheria from carriers, 2 strains of each culture being tested.*

(Result after 8 days' incubation.)

Culture No.	Reaction.		Net increase acidity.	Culture No.	Reaction.		Net increase acidity.
	Culture.	Blank.			Culture.	Blank.	
1392	+6.5	+1.9	4.6	3473a	+6.4	+2.0	4.4
1392a	+6.1	+1.9	4.2	3992	+5.8	+1.6	4.2
1839	+5.5	+1.9	3.6	3992a	+5.8	+1.6	4.2
1839a	+5.9	+1.9	4.0	4013	+3.8	+1.6	2.2
2177	+4.0	+1.9	2.1	4013a	+3.6	+1.6	2.0
2177a	+5.0	+1.9	3.1	4080	+4.7	+1.1	3.6
2248	+3.5	+1.9	1.6	4080a	+4.7	+1.1	3.6
2248a	+3.2	+1.9	1.3	4206	+1.7	+1.1	.6
2650	+4.5	+1.5	3.0	4206a	+1.8	+1.1	.7
2650a	+4.5	+1.5	3.0	5398	+4.0	+1.1	2.9
2944	+6.4	+2.0	4.4	5398a	+2.6	+1.1	1.5
2944a	+6.8	+2.0	4.8	6507	+5.3	+1.1	4.2
2983	+6.2	+2.0	4.2	6507a	+5.7	+1.1	4.6
2983a	+5.8	+2.0	3.8	9009	+4.6	+1.1	3.5
3020	+3.5	+2.0	1.5	9009a	+4.9	+1.1	3.8
3020a	+3.7	+2.0	1.7	9337	+5.4	+1.1	4.3
3473	+6.2	+2.0	4.2	9337a	+5.6	+1.1	4.5

It will be seen that all are acid producers, only one nonvirulent culture (two strains) causing an increase of less than one.

AGES AND SEX OF CARRIERS.

It is of interest to note the wide range of ages among persons found with positive cultures. The youngest among the carriers found was 4 years of age, the oldest 72. Four carriers were 60 years old or over and 8 under 15, the others ranging between these ages.

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Table 7 shows the distribution of carriers in the different age groups.

In regard to sex it is found that among the 1,600 males examined there were detected 12 carriers, or 0.75 per cent, and that among the 2,493 females examined there were found 26 carriers, or 1.09 per cent.

TABLE 7.

Age.	Number positives.	Number in group.	Per-centage positive.	Age.	Number positives.	Number in group.	Per-centage positive.
0–1 years	.....	158	.....	36–50 years	3	450	0.67
2–5 years	1	510	2	51–65 years	3	176	1.73
6–10 years	4	599	67	66–80 years	2	82	2.5
11–15 years	7	673	1.05	80 years	.....	3	.....
16–25 years	8	699	1.15	Unknown (all adult females)	4	110	3.77
26–35 years	6	633	.95				

SUPPLEMENTARY STUDIES.

VIRULENCE AND ACID TESTS ON B. DIPHTHERIÆ—DIPHTHEROID BACILLI AND HOFFMAN'S BACILLUS.

Virulence and acid production tests were made on 30 cultures morphologically diphtheria, isolated from clinical cases. We also tested 47 cultures morphologically Hoffman's bacillus and 12 cultures of short barred (D′ and E′ type) organisms that were isolated, some from clinical diphtheria and some from healthy individuals.

In no case was there found a virulent culture of Hoffman's bacillus or of the short barred forms. Among those morphologically B. diphtheriæ, all isolated from clinical cases, 29 were found virulent and 1 nonvirulent. The single nonvirulent organism was secured from the throat of a patient while in the active stage of the disease. This same patient became on convalescence a carrier, virulent B. diphtheriæ being isolated from a throat culture taken over a month after all clinical signs had disappeared. This would suggest that this individual harbored both nonvirulent and virulent organisms, the former being isolated at the first and the latter at the second test.

Among the organisms morphologically B. diphtheriæ, acid production ranged from an increase of 2.4 as the lowest figure to 4.7 as the highest. The single nonvirulent culture caused an increase of 4.3.

Among the barred bacilli, acid production ranged from 2.4 increase to 3.8 increase, with one exceptional 5.5 increase.

Among the cultures morphologically Hoffman's bacillus the range was from a decrease of 1.9 to an increase of 1.6. Among the 47 cultures, however, only 6 showed an increase, all of the others causing a decrease in acidity.

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PREVALENCE OF HOFFMAN'S BACILLUS.

The method of recording our findings in the smears examined for carriers has given us some interesting data with respect to the frequency of occurrence of Hoffman's bacillus. In the 4,093 individuals examined we found 1,327, or 32.4 per cent, with this bacillus. In a special group of 2,319 of these individuals examined by the "three cultures" method we found it in 971, or 41.9 per cent. The latter finding we believe to be the more nearly representative of actual conditions. Throat cultures from 2,666 individuals showed its presence in 113, or 4.2 per cent, whereas nose cultures from 2,350 individuals showed it in 790, or 33.7 per cent. These findings, in harmony with those of previous workers, point very clearly to the nose as the normal habitat of this organism.

SUMMARY.

1. Cultures from 4,093 healthy people in the city of Detroit were examined for diphtheria bacilli.

2. Thirty-eight (0.928 per cent) were found to harbor B. diphtheriæ (morphological).

3. Of 19 cultures isolated from 19 of the carriers, 2 were found to be virulent, suggesting a possible 0.097 per cent of the individuals examined as carriers of virulent bacilli.

4. Comparison of the value of different types of single cultures for the detection of carriers shows that the throat culture gives the lowest and the combined nose and throat the highest results. The latter, however, is but slightly higher than that from the nose alone.

5. The combined results of a throat and of a nose culture give markedly better findings than those of any single culture.

6. The combined results of a throat, a nose, and of a combined nose and throat gave us the highest findings, but this does not appear to be greatly superior to the two-culture finding.

7. All carrier cultures islolated, 19 in all, were found to be acid producers.

8. Twenty-nine of 30 cultures of B. diphtheriæ from clinical cases were virulent and all 30 were acid producers.

9. Of 47 cultures morphologically Hoffman's bacillus, 6 showed some acid production; 41 were alkali producers. All 47 cultures were avirulent.

10. Hoffman's bacillus was present in at least 41.9 per cent of 2,319 individuals.

REFERENCES.

1. Wesbrook, Wilson and McDaniel, 1900. "Studies upon the distribution of certain varieties of the diphtheria bacillus." Transactions of the Assoc. of American Physicians, 1900.

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2. Eyre, J. W. H. "The bacillus diphtheriæ in milk." Brit. Med. Journ. 1899, II, 586.
3. Nuttall and Graham-Smith. The bacteriolgy of diphtheria, 1913, p. 192.
4. Committee of the Association of Massachusetts Boards of Health. "Report on diphtheria bacilli in well persons." Journ. Mass. Association of Boards of Health, July, 1902, Vol. 12, pp. 74–119.
5. Von Sholly, Anna I. "A contribution to the statistics on the presence of diphtheria bacilli in apparently normal throats." Journ. Infect. Diseases, Chicago, 1907, vol. 4, pp. 337–346.
6. Moss, William L. "Diphtheria bacillus carriers." Transactions of the XV International Congress on Hygiene and Demography, 1913, Vol. IV, pt. 1, p. 156.
7. Ford, W. W. "The Recent Epidemic of Diphtheria in Johns Hopkins Hospital and Medical School: General procedures adopted." Johns Hopkins Hospital Bulletins, Oct., 1911, p. 357.
8. Neisser, M. and Gins, H. A. "Ueber Diphtherie." Handbuch Der Pathogenen Mikroorganismen, Kolle und von Wasserman. Second edition, Vol. V, p. 931.

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III.—THE EXCRETION OF THYMOL IN THE URINE.[1]

By Atherton Seidell, *Technical Assistant, Hygienic Laboratory.*

It has been shown in a previous paper[2] from this laboratory that only insignificant amounts of ingested thymol are excreted in the feces. This would indicate that thymol is almost completely absorbed from the alimentary tract and must therefore be oxidized in the body or excreted in the urine. That the latter process undoubtedly takes place to some extent, at least, was shown a number of years ago by Blum,[3] who isolated thymol glycuronate in the form of the dichlor compound from the urine of patients who had received thymol. Although the quantitative recovery of thymol has apparently not been attempted, experiments with phenol have been made. Thus Tauber[4] showed that of various amounts of phenol administered to a dog, less than 50 per cent was recovered from the urine and only traces from the feces. Similar results were also obtained by Schaffer[5] and the additional fact established that no increase in excreted oxalic acid occurs after phenol. An experiment made upon himself by de Jonge[6] showed that, of a total of 0.100 gm. phenol taken in three doses during some seven days, approximately 78 per cent was recovered in the urine.

The method used by Blum for the isolation of the thymol glycuronate is not susceptible of quantitative application, and no experiments have so far been made which show what proportion of ingested thymol is excreted in the urine. The results of Tauber and of Schaffer indicate that only 31 to 62 per cent of phenol is recovered according to the amount given; the higher percentages being in the cases af the larger doses. It was believed that similar data concerning the fate of thymol in the body would be of value in showing the mechanism of the action of thymol upon hook worms and consequently in indicating the path to be followed in developing drugs of greater potency and safety than thymol.

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[1] Manuscript submitted for publication Jan. 16, 1915.
[2] Schultz, W. H., and Seidell, A. Orig. Com. 8th intern. Cong. Appl. Chem., *19*, 281 (1912).
[3] Blum. Ztschr. f. physiol. Chem., *16*, 514 (1892).
[4] Tauber. Ztschr. f. physiol. Chem., 2, 366 (1878).
[5] Schaffer. J. f. prakt. Chem. [2] *18*, 282. 1878).
[6] de Jonge. Ztschr. f. physiol. Chem., *5*, 181 (1897).

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The method which was developed for the determination of thymol in urine was similar to that used in the work upon feces, and consisted in steam distillation from strongly acid solution, redistillation of the nearly neutral distillate and titration of the second distillate by the bromine-hydrobromic acid method.[1] The apparatus was composed of two round-bottom distillation flasks of about 300 c. c. capacity each, arranged in series and tilted back in such a manner that mechanical carrying over of the liquid from one to the next flask was prevented to the greatest possible extent. A steam generator was provided in front of the first flask and an efficient condenser followed the second.

The preliminary experiments upon normal urine were designed to show the most successful means of preventing substances which might interfere with the titration, from coming over with the thymol. This was necessary since the method for the titration of the thymol requires that the solution be neutral, and contain no other compounds than thymol, which liberate hydrobromic acid upon bromination. The earlier experiments indicated that a previous treatment of the sample with aqueous copper sulphate and dilute sodium hydroxide solutions, followed by removal of the precipitate by centrifugation and decantation, was efficient in eliminating a considerable portion of the interfering substances. Such a treatment was, however, not found necessary in cases where the urine contained large amounts of thymol and a relatively small volume of it could therefore be used for a determination. Since the hydrolysis of the thymol glycuronate, which is the form of combination in which the thymol occurs in the urine, can only be effected by heating with strong mineral acids, provision must naturally be made for retaining the volatile acids, which distill over from the strongly acidified solution, and would therefore interfere with the titration of the thymol. The means by which this was finally accomplished consisted in adding solid magnesium oxide to rather strong copper sulphate solution contained in the second flask of the apparatus, thus yielding a suspension of cupric hydroxide and magnesium oxide in aqueous copper sulphate solution. By this arrangement, the excess of strong acid added to the urine sample in the first flask retains the volatile ammonium compounds, and the faintly alkaline medium in the second flask retains a portion, at least, of the volatile acids which are set free from the urine sample. The copper sulphate solution also performs the further function of retaining hydrogen sulphide and similar compounds occasionally yielded by certain samples of urine. It was found that a steam distillation of the urine samples in the double flask apparatus as above described yielded in practically all cases a distillate neutral to litmus paper. In order, however, to be more certain of obtaining a distillate as free as

[1] Seidell. Am. Chem. J., 47, 508-26 (1912).

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possible from substances which might interfere with the titration of the thymol, the procedure was extended to include the redistillation of the neutral distillate. This was distilled from flask 1 of the apparatus, and fresh quantities of the reagents, copper sulphate and magnesium oxide, placed in flask 2. By this double distillation method it was found that blank determinations upon normal dog urine required per 100 c. c. of urine, from 1.0 to 3.0 c. c. of standard 0.05 normal sodium thiosulphate for volatile constituents which accompany the thymol. These quantities of thiosulphate correspond, respectively, to 0.0037 and 0.0113 gram thymol.

One other point which arose was as to the furfural which, according to the Tollens method for the estimation of pentoses, pentosans, and glycuronic acid, would be set free from urine containing thymol glycuronate, during the acid distillation. Tests of the distillates with aniline acetate were therefore made in many instances, but negative results for furfural were obtained in all cases. In one experiment, however, upon a sample of urine containing a large amount of thymol glycuronate and using hydrochloric acid according to the details prescribed in the Tollens method, positive results for furfural were obtained, even up to over 200 c. c. of distillate. It was concluded, therefore, that under the conditions of the distillation as selected for the thymol determination, negligible amounts of furfural accompany the thymol.

Of the several details of the method which required refinement, that of the amount of acid to use for liberation of the thymol from its combination with glycuronic acid was given early attention. A sample of urine amounting to several hundred cubic centimeters was obtained from a dog to which a rather large dose of thymol had been given. Aliquot portions of this were distilled with the addition of different amounts of concentrated sulphuric acid and diluted with water in each case to a volume of about 200 c. c. The following results were obtained:

Aqueous mixture in distilling flask No. 1.			Thymol found.
Urine.	Concentrated H_2SO_4.	H_2O.	
c. c.	*c. c.*	*c. c.*	*Gram.*
100.....	10	90	0.099
200.....	30	.....	.220+2=0.11
100.....	20	80	.125
100.....	30	70	.135
100.....	40	60	.119

Similar determinations were also made on two other samples of urine, and results in agreement with the above were obtained. From these it was concluded that a satisfactory concentration of sulphuric

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acid to use is 10 per cent by volume, that is, 20 c. c. of concentrated sulphuric acid added to 80 c. c. of water and this mixed with 100 c. c. of urine.

The mixture in the second flask consists of about 5 grams of copper sulphate dissolved in about 100 c. c. of water to which is added about 1 to 2 grams of magnesium oxide.

During a distillation, the acidified urine sample in the first flask gradually becomes darker as the heating progresses. The thymol begins to distill over as soon as the boiling point of the contents of the flask is reached. The approximate quantity of thymol is indicated by the amount of beading noted in the condenser and the opalescence of, or floating globules on, the surface of the distillate. Practically all the thymol comes over with the first 100 c. c. of distillate; but, to be certain that none remains behind, a second 150 c. c. portion of distillate is collected in a separate receiver. Glass-stoppered bottles of about 300 c. c. capacity are convenient receptacles for the distillates since the titration of the thymol can be made directly in them.

The titration of the distillate is made as follows: About 1–2 c. c. of carbon tetrachloride are added to the bottle and bromine vapor poured in intermittently with active shaking, until a permanent marked yellow color of the carbon tetrachloride layer is obtained. The bottle is then allowed to stand in a dark place for about one-half an hour. Approximately 6 c. c. of carbon bisulphide and 5 c. c. of 5 per cent potassium iodide are added and the liberated iodine titrated with standard, approximately 0.05 normal thiosulphate solution. Five c. c. of 2 per cent potassium iodate solution are then added and the liberated iodine corresponding to the free hydrobromic acid, is titrated with the same standard thiosulphate. The difference between the first and second readings of the thiosulphate solution, corresponds to the hydrobromic acid formed in the bromination of the thymol. The calculation is made on the basis of 2 molecules of HBr per 1 of thymol; 1 c. c. 0.05 normal thiosulphate is, therefore, equal to 0.003753 gram thymol.

The experiments on dogs were made as follows: A cage provided with a false bottom of woven wire above a metal covered bottom, arranged to convey the urine to a receptacle, was used. The dog was usually kept in the cage for a day previous to administration of the thymol in order to obtain a sample of normal urine. The thymol was administered in a gelatin capsule which was always placed inside of a larger capsule to guard against possible loss while inducing the dog to swallow it. After the administration of the thymol, the urine receptacle was examined from time to time and whenever a sample was present it was removed and a fresh bottle placed under

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the cage. The exact time at which each sample of urine was voided was not known, but only the time of the visits at which the samples were found. The following table contains a summary of an experiment made with dog A:

Date.	Amount thymol administered.	Urine samples.		Thymol found.	Per cent thymol recovered.
		Time after thymol.	Volume of sample.		
1914.	*Gram.*	*Hours.*	c. c.	*Gram.*	
July 22–23	0.50	6–23	155	0.18	44
		23–24	152	.04	
July 26–30	.61	5½–23	420	.11	44
		29½–30½	48	.01	
		30½–48	300	.01	
July 30–31	.77	6–22½	570	.38	50
		26½–29½	250	.02	

From this experiment it is apparent that less than one-half of the thymol absorbed from the alimentary tract is excreted in the urine. That which is excreted, comes through fairly promptly; probably within the first few hours after its administration.

Three mongrel dogs were used for the experiments. Dog A was a female bull-fox terrier of 23½ pounds weight. Dog C was a cur, of approximately 20 pounds weight. This dog had been used previously for hookworm experiments and was several times infected with worms and treated with thymol and other hookworm remedies. Dog D was a male Scotch terrier of 18½ pounds weight and had not been previously kept in a urine collecting cage. He therefore showed considerable restlessness at first accompanied by retention of urine, and it will be noted that this condition apparently affected the results obtained in the first experiment made with him, October 8–12.

Although previous work had shown that only inconsiderable amounts of thymol come through with the feces, several determinations were made in the present series of experiments upon samples of feces collected simultaneously with the urine samples. The results confirmed the previous conclusion as to the practical absence of thymol from the feces.

Many experiments were made, to ascertain whether the method as devised was giving the total amount of thymol present in the sample. As already shown, more acid for the hydrolysis was not advantageous. It was also found that increase of the amount of distillate did not augment the yield. Blank determinations made with mixtures of normal urine and thymol showed that no appreciable loss due to reagents or manipulation was experienced. Blank distillations of normal urine did show however, as already mentioned, that small varying amounts of substances which react in the titration just as

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thymol, were obtained. The corrections due to these were of course found to be roughly proportional to the volume of the sample of urine. It was therefore advisable, in making determinations upon urines containing thymol, to use as small an aliquot as would yield enough thymol for accurate titration. In this connection, however, it should be noted that, during the first acid distillation and sometimes even in the second neutral distillation, a darkening occurred which probably indicated a destruction of some of the thymol. This would therefore constitute a compensating negative error, balancing to a certain extent the plus error, due to accompanying substances which react as thymol during the titration. Taking these points into consideration, and the fact that very great accuracy is not required, it did not appear expedient to attempt to determine correction factors to apply to the results of the titrations. The uncorrected results, as reported in the tables, are believed to show certainly the maximum amounts of thymol which are excreted in the urine in combination with glycuronic acid.

Among the several other points which were investigated during the development of the method, was the stability of the thymol glycuronate. A sample of urine, which was found by analysis to contain a rather large amount of thymol, was subjected to steam distillation without the addition of the acid required for hydrolysis. No thymol was found in the distillate. On adding the necessary amount of acid and again distilling, the same amount of thymol was found as in an original direct determination. A number of experiments upon samples of urine containing thymol glycuronate, and kept in the laboratory for rather long periods, showed that no appreciable reduction in the amount of thymol obtainable from them occurred. It was therefore apparent that no necessity existed for the very prompt determination of thymol in samples of urine.

In the case of the experiments upon human patients, recorded in the accompanying table, the samples were collected by Acting Asst. Surg. William S. Keister at the Wilmington (N. C.) Hospital of the Public Health Service. Two patients, B. B. and T. C. B., boys, 13 and 9 years old, respectively, were each treated for hookworms by being given the usual 5 grain capsule of thymol at 7, 8, and 9 a. m. The urine passed between 7 a. m. and 12 noon constituted the first sample, that between noon and 6 p. m. the second, and that passed between 6 p. m. and 6 a. m. the third. These were forwarded to the Hygienic Laboratory and the thymol determinations made as described above for the samples of dog urine.

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TABLE I.—*Showing the thymol content of urine from dogs and human patients.*

DOG URINE.

Dog.	Date.	Dose administered.		Urine samples.		Thymol found.	Per cent thymol recovered.
		Thymol.	Olive oil.	Time after thymol.	Volume of sample.		
	1914.	*Gram.*	*Gram.*	*Hours.*	*c. c.*	*Gram.*	
C	Aug. 25–27	0.67	9.37	0–19½	85	0.23	
				19½–22	95	.07	46
				42–44½	116	.02	
A	Aug. 31–Sept 1	.60		21½–24	65	.085	
				5½–22	480	.16	41
				22–29	83	Trace.	
C	Sept. 9–11	1.046		0–1	74	0.01	
				7–24	71	.346	38.5
				30–48	109	.045	
A	Sept. 15–17	.338		1–18	75	.126	46
				24–42	74	.030	
C	Sept. 21–23	.303		2–19	81	.105	41
				25½–44½	117	.019	
A	Sept. 23–26	1.277		2–19	127	.376	
				25–46	192	.073	36
				46–70	88	.011	
C	Sept. 29–Oct 1	1.856		3½–21	211	.51	
				28–49½	149	.07	31
				49½–52	50	.01	
D	Oct. 8–12	.81		26½–44	136	.104	
				44–46	92	.061	29
				51–69	292	.072	
D	Oct. 27–29	1.317		0–3	140	.077	
				6–23	125	.335	
				23–25½	60	.031	35
				30–48½	85	.022	
D	Oct. 29–31	1.238	14.24	5½–23	218	.424	
				29–47	81	.030	36

HUMAN URINE.

Patient.	Date.	Dose administered.		Urine samples.		Thymol found.	Per cent thymol recovered.
		Thymol.	Time.	Time after thymol.	Volume of sample.		
	1914.	*Gram.*	*a. m.*	*Hours.*	*c. c.*	*Gram.*	
B. B	Oct. 13–14	0.32	7	0–5	280	0.244	
		.32	8	5–11	85	.046	35
		.32	9	11–23	395	.046	
T. C. B	do	.32	7	0–5	175	.264	
		.32	8	5–11	30	.018	33
		.32	9	11–23	490	.039	

The analytical results are recorded in Table I in the order in which the experiments were made. Two points were particularly in mind in selecting the dose of thymol to be given; first to ascertain the effect of varying amounts of thymol upon the percentage of it excreted in the urine, and, second, to ascertain what effect, if any, the simultaneous administration of an oil would have upon the excretion of the thymol.

It is seen that, although the results agree in general with those of Tauber upon phenol, they show a higher percentage of recovery

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from the smaller than from larger doses. Thus in the case of doses of 0.3 to 0.7 gram thymol, the amount recovered varied from 41 to 46 per cent; while with doses of 1.2 to 1.8 grams, only 31 to 36 per cent was recovered.

In regard to the effect of the simultaneous administration of oil, the two experiments which were made show that very slight, if any, effect was produced.

One other point, which was shown by the experiments, is that no significant difference in the ratio of recovered thymol is noted between initial and subsequent doses. Of the three dogs one, C, had been previously used for many experiments and had received large doses of thymol; one, A, had been given three doses of thymol in a preliminary experiment; and one, D, had not previously received thymol. In spite of this, with one exception which was probably due to another cause (Dog D, Oct. 8–12), the apparent fate of thymol in the three dogs is approximately the same. In regard to the two human patients, it is seen that both with a dose of thymol proportionally equivalent to the smallest given to the dogs, excreted approximately the same percentage of thymol that the dogs excreted after a proportionally much larger dose.

As to what becomes of the thymol that is not excreted in the urine as the glycuronate, nothing positive can be said at present. Surmises as to its fate are of little value; nevertheless, one point should be mentioned and that is, the possibility of its temporary fixation by the tissues, or elimination by volatilization with the expired air. According to a review of the literature by C. Neuberg,[1] the experiments of several investigators have failed to show that the glycuronic pairing occurs in the liver. It is therefore probable that thymol is present in the blood stream passing through the lungs, in which event a certain amount would no doubt be lost by volatilization even in spite of the slight alkalinity of the blood. An effort, however, to detect thymol by its odor in the expired breath of a dog after giving a large dose was unsuccessful.

In this connection, it is generally known that, in fatal cases of phenol poisoning, death eventually occurs from asphyxia. Autopsies made by Langerhans[2] showed that marked bronchitis and laryngitis had been produced, not by direct aspiration of the phenol, but by indirect action after absorption from the intestinal tract. It has been observed in fatal thymol poisoning that marked congestion and even consolidation of the lungs has occurred (Cushny).

[1] Ergebn. d. Physiol. (3) *1*, 447 (1904).
[2] Deutsche med. Wchnschr., *19*, 269, 1256 (2893).

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Although a method for the accurate determination of phenol in the urine has been developed[1] and many determinations made by various investigators upon normal and pathological urines of both man and animals, a careful search of the literature has failed to show that any experiments other than the old ones referred to above have been made with the urine of animals to which known amounts of phenol have been administered. The observation of Tauber and Schaffer, that about one-half of the phenol can not be recovered from either the feces or urine, appears not to have attracted particular attention.

SUMMARY.

A method for the determination of thymol in urine has been developed. Applying this method to samples of urine obtained from dogs to which thymol was given, it was found that 41 to 46 per cent was recovered when doses of 0.3 to 0.7 gram were given and 31 to 36 per cent when doses of 1.2 to 1.8 grams were given. The simultaneous administration of olive oil apparently caused very slight if any effect upon the percentage of excreted thymol. It is a question, therefore, whether oils really increase the amount of absorption of thymol or only the rate. Determinations upon the urines of two human patients who received the thymol treatment for hookworms gave results agreeing in general with those obtained upon samples of urine from dogs. These results, in connection with previous experiments upon the determination of thymol in feces, show that of the thymol administered, from one-half to two-thirds is apparently destroyed or temporarily fixed in the body. These observations are in accord with the work done by Tauber and Schaffer many years ago upon phenol. As yet no satisfactory explanation of this apparent disappearance of administered phenols has been found.

[1] Neuberg, C., Der Harn, 1911, 1. Teil, p. 476.

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IV. THE STERILIZATION OF DENTAL INSTRUMENTS.[1]

By H. E. Hasseltine, *Passed Assistant Surgeon, United States Public Health Service.*

The possibility of the transmission of disease from one person to another through the medium of instruments and appliances used in dental operations has long been recognized. Reports of such occurrences are frequently heard from the laity, but authentic reports in scientific publications are practically never published. Few men will deny that such cases do occur occasionally; their frequency, however, is not determinable.

Anyone familiar with asepsis has probably noticed errors in the surgical technique of a dentist while receiving dental treatment. Among these errors may be mentioned the placing of sterilized instruments on a swinging tray or glass plate which has not been sterilized, the cleaning of burrs on a scratch wheel which has not been sterilized since the burrs used on the previous patient have been cleaned thereon, and the frequent handling of the cable of the dental engine, which receives contamination from one patient through the operator's hands and in turn returns a portion of this contamination to the operator's hands when used on subsequent patients. These are some of the errors of technique seen personally, and are mentioned here to emphasize the necessity of having everything which comes in contact with the instruments or hands of the operator free from organisms obtained from previous patients in order to prevent transmission of infection from one patient to another.

A sterile towel over the tray, a scratch wheel which can be removed and sterilized with the instruments, and a simple sterile linen covering to put over the cord of the engine would make the operation many times more acceptable to the critic, provided, of course, a fresh towel and covering were used for each patient and the scratch wheel sterilized when each patient vacates the chair.

For improvement of the technique of the future dentists we should look to the dental schools. They all have courses in bacteriology, which, however, in many schools are largely theoretical instead of practical. The morphology and cultural characteristics of various organisms are considered, but their resistance to disinfectants is passed over by noting what certain books say regarding this phase

[1] Manuscript submitted for publication Apr. 16, 1915.

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of the subject. Little actual laboratory work is done to show the relative value of the sterilizing agents applicable in dentistry and how their efficiency is tested. As a result the student forms the opinion that any sterilizing agent is effective, and does not learn to check his sterilization by bacteriological tests. For the coming dentists the improvement should come through the schools. For those already in practice it must come through reading and exchange of ideas among the men of the dental and medical professions.

Realizing the necessity of improvement, some members of the dental profession are striving to bring about better sanitary conditions in the offices of dentists at large; also among their patients, by teaching them oral hygiene. This work is most commendable, and to this end the officers of some dental societies have asked the Surgeon General of the Public Health Service to work out a detailed method for sterilizing dental instruments and appliances, keeping in mind the important factors, simplicity, efficiency, and duration of the process of sterilization. As a result of this request the writer was designated by the Director of the Hygienic Laboratory to consider the matter, make experiments, collect data, and make a report thereon.

The progress of the work has been interrupted frequently by exigencies of the service and the report much delayed as a result.

THE STERILIZATION OF DENTAL INSTRUMENTS.

In considering this subject the writer has endeavored to keep within practical bounds rather than to pose as an idealist.

In testing the efficiency of various methods of sterilization of dental instruments, the consideration of spore-forming organisms has been disregarded. A high degree of heat for a prolonged period is required to kill the spores of spore-bearing pathogenic organisms. Fortunately, the number of such organisms is comparatively few. The vegetating forms of these organisms are killed as easily as are the nonspore bearers. The spore represents a defensive element of the organism against unfavorable influences; that is, though capable of becoming alive, it is apparently in a lifeless phase. Since it remains in the spore stage while in conditions unfavorable for its growth, the spore is easily moved from place to place by mechanical means, thereby increasing the chance of finding a more suitable environment.

By reason of this fact mechanical means of removal of spores from instruments is relied upon. Mechanical cleansing of instruments by a brush or sponge, preferably in running water, will reduce the number of spores so that the number remaining will be too small to consider. For experimental data on the efficiency of mechanical cleansing in the removal of spores, the reader is referred to Francis (1).

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Such organisms as the pus-producing cocci, the bacillus of typhoid fever, the bacillus of diphtheria, the bacillus of tuberculosis, the *Treponema pallidum* (syphilis), the bacillus of influenza, the amœbæ, and the thrush fungus, are known organisms that should be considered. To this list may be added the virus of diseases of unknown or uncertain origin, such as that of measles, scarlet fever, mumps, infantile paralysis, and smallpox, all of which seem to be caused by nonspore-bearing organisms.

Of the nonspore-bearing organisms, the staphylococci are reported to be the most resistant to heat, our most efficient disinfecting agent. On this account various strains of staphylococci were used as the test organisms in the experiments made in connection with this investigation.

TABLE I.—*Showing thermal death point of various organisms according to different authorities.*

Authority.	Influenza.	Staphylococcus aureus.	Streptococcus.	Pneumococcus.
Sternberg (2)	60°, 5 minutes	Moist, 58°, 10 minutes. Dry, 100°	54°, 10 minutes	52°, 10 minutes.
McFarland (3)		62°, 10 minutes. 80°, 1¼ minutes		
Muir and Ritchie (4)		80°, 30 minutes		
Park and Williams (5)	60°, 5 minutes	80°, 5 minutes	54°, 10 minutes	
Hiss and Zinsser (6)	60°, few minutes	58°, 10 minutes. Dry, 90 to 100°	54°, 10 minutes	52°, 10 minutes.
Jordan (7)		80°, 30 minutes		
Abbott (8)		62°, 10 minutes	54°, 10 minutes	52°, 10 minutes.
Rosenau (9) (10)	60°, 10 minutes		54°, 10 minutes	52°, 10 minutes.

Authority.	Meningococcus.	Typhoid.	Diphtheria.	Tubercle bacillus.
Sternberg (2)		56°, 10 minutes	58°, 10 minutes	70°, 10 minutes.
McFarland (3)		60°, 10 minutes	58°, 10 minutes	60°, 20 minutes.
Muir and Ritchie (4)		60° 30 minutes	60°, 10 minutes	70°, 1 hour.
Park and Williams (5)	Readily	60°, 1 minute	60°, 10 minutes	80°, 1 minute.
Hiss and Zinsser (6)	Extremely sensitive to heat.	56°, 10 minutes	58°, 10 minutes	60°, 20 minutes. 80°, 5 minutes.
Jordan (7)			55°, 45 minutes	60°, 20 minutes.
Abbott (8)		60°, 10 minutes	58°, 10 minutes	80°, 5 minutes. 65°, 15 minutes.
Rosenau (9) (10)		60°, 20 minutes	Less than typhoid.	60°, 20 minutes.

Table I shows the thermal death point of various organisms, according to different authorities on bacteriology. It was found that the stock laboratory cultures of staphylococci were much less resistant than strains of the same organism obtained from human beings. For this purpose smears from cases of suspected diphtheria or from cases of tonsillitis were used, thereby getting organisms similar to those encountered in the mouth. Mixed cultures were used to simulate the conditions found in nature. In a few cases, *Bacillus subtilis*, a nonpathogenic spore-forming organism was encountered.

The resistance of the staphylococci was also tested, when dried on instruments prior to sterilization and when not dried. The resistance

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was always greater when the contaminated instruments were dry. Consequently the dried infectious material was used in most of the tests.

The physical processes involved in sterilization have been the subject of much research and discussion. It is not necessary to consider here to any extent the theories. They can be stated briefly as the coagulation and hydrolytic theories. The first strives to show that the cell substance of the organism is coagulated by the disinfecting agent, just as the white of an egg is coagulated by heat when cooked. The second theory claims that the death of the organism is brought about by the introduction of water into the cell substance, the consequent hydrolysis being accelerated by the disinfecting agent.

The process of sterilization has been described by Phelps (11) as an increase of the death rate of organisms. But in determining the result of this process there are three factors to be considered, viz: (*a*) The velocity of the death rate of the organisms; (*b*) the time through which (*a*) is allowed to proceed; (*c*) the number of organisms present. The product of these three factors gives the result. Sterilization is, therefore, a relative result from a mathematical viewpoint and is usually arbitrarily recorded as perfect when the number of bacteria in the volume tested is less than one. On this death rate of organisms, the number present, and the time allowed, depend the efficiency of a sterilizing agent.

However, the exact mode of killing the organisms does not interest the practicing dentist and surgeon so much as does the assurance that all will be killed, in some manner, under certain conditions.

The methods of sterilization employed at present in most dental offices may be classified as follows:

Thermal	Boiling in water.	Chemical	Carbolic acid, followed by alcohol.
	Use of boiling water.		Other coal-tar products, followed by alcohol.
	Passing an instrument through a free flame.		Formaldehyde vapor in a tight chamber.
	Moist heat in a closed or open chamber.		Other chemicals, such as gasoline, solution of biniodide of mercury.
	Dry heat in a closed chamber.		

The efficiency of most of these methods was tested, and the advantages and disadvantages of each considered.

BOILING IN WATER.

Results of experiments.—Most authorities state that nonspore-bearing organisms are killed by boiling for 10 minutes. A few have reported organisms of this class that have resisted boiling for 30 to 60 minutes, but such are of too infrequent occurrence to require consid-

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eration. Of the various strains of staphylococci in mixed culture, which I have tested, I have found none that survived 3 minutes' boiling. This means exposure to water heated until noticeable ebullition takes place before the organisms are placed therein, the time being taken by the watch. Undried instruments were sterilized in 2 minutes. Sterility tests were made by dropping the sterilized instruments into tubes of nutrient bouillon and incubating these for 48 hours at 37°. Though my experiments show sterilization in a shorter time, a period of 10 minutes' boiling is recommended, to provide an ample margin on the side of safety. A small amount of alkali, such as sodium carbonate, or sodium hydroxide, should be added to the water to prevent rusting of instruments.

The advantages of this method are: (*a*) It is the most rapid and most efficient; (*b*) it is always available where fire and water can be obtained; (*c*) the procedure is simple and can be carried out by any one; (*d*) the expense of sterilization by this method is small.

The disadvantages are: (*a*) Dulling of the sharp edge of cutting instruments, such as knives, lancets, etc.; (*b*) increase of effect of action of any chemical impurity in the water upon the instruments, a factor that will vary according to local conditions.

USE OF BOILING WATER.

Results of experiments.—If used immediately after the heat is cut off, and in quantity sufficient to guard against a rapid cooling, this method is nearly the equivalent of boiling, so far as practical results are concerned. The use of 1 gallon of water, boiled until the moment before the instruments are submerged in it, sterilizes as rapidly as does boiling, at least during the first five minutes of exposure. If care be taken to carry out this procedure fully, the method is efficient, the advantages and the disadvantages being the same as with boiling, save that the rapid cooling of the water will necessitate reheating to the boiling point to insure proper results.

The use of water of too low temperature or for too short a period of time makes possible incomplete sterilization. As the temperature is lowered the period of exposure must be lengthened; but, as the loss of heat is uncertain, the required length of exposure will necessarily be uncertain. On account of the uncertainty of the temperature of the water, except it be boiled immediately prior to use on each occasion, this method is not as good as boiling or the use of a *known* temperature at a degree lower than the boiling point.

PASSING AN INSTRUMENT THROUGH A FREE FLAME.

This method is effective, since, if properly carried out, it virtually amounts to incineration of the organisms. The degree of heat to which the instrument is subjected is much higher than the boiling

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point, and on this account only a few instruments can be sterilized by this method without interfering with cutting qualities, temper of steel, or plating of instruments. It is applicable to certain small instruments whose cost is not high, but is not available for general use.

MOIST HEAT IN AN OPEN OR CLOSED CHAMBER.

This is applied by the use of steam in an open chamber (Arnold) or in a tight chamber under pressure (autoclave). Its use for instruments is not very extensive, as the same results can be obtained by direct boiling and some time saved, since boiling a small amount of water requires much less time than heating up a large apparatus. It is of greatest value for sterilizing linens, gowns, towels, etc., and the steam under pressure is preferable, on account of its greater penetration.

DRY HEAT IN A CLOSED CHAMBER.

This method is not used for instruments, on account of the high temperature required and the long time required to carry it out. It can be used for glassware or for sterilizing linen, if the temperature be not too high.

USE OF CARBOLIC ACID FOLLOWED BY ALCOHOL.

This method consists of submersion of the instruments in phenol of varying strength. The solubility of phenol in water is about 1 part in 20, giving a 5 per cent solution. This solution is more effective than the pure phenol. After submitting the instruments to this treatment they are immersed in alcohol, to remove the excess of phenol, and may then be rinsed in water, or used without rinsing.

Results of experiments.—With many strains, 10 minutes' exposure to 5 per cent phenol, followed by one minute in alcohol, sufficed to sterilize. Some strains of staphylococci, however, were more resistant and uniformly gave growth after 15 minutes; in a portion of the tubes even after 30 and 45 minutes' exposure. No strain used survived one hour in 5 per cent phenol. The same resistant strain was uniformly killed by boiling for three minutes. It was also killed by three minutes' exposure in an 80° water bath.

Its advantages are: (a) The cost is moderate; (b) it can be applied to practically every instrument and appliance without damage resulting therefrom.

Among its disadvantages are: (a) It requires a longer period of time to sterilize; (b) it requires more care in the application of the method (care must be taken to see that all surfaces of instruments are exposed to the solution); (c) instruments must be removed from phenol by forceps, as the solution has a bad effect on the skin if the

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hands are used in it frequently; (d) it requires a much better trained assistant, or the attention of the dentist himself, to use this method properly; (e) the odor of phenol is, to some, objectionable.

The use of other coal-tar products resembles that of phenol in application and efficiency. The advantages and disadvantages mentioned under phenol apply also to these products, except as follows: (a) Some have a higher coefficient than phenol; that is, they are more germicidal than phenol; (b) some have a soapy composition, giving them the cleansing property of soap when mixed with water; (c) their cost, however, is in most cases considerably greater.

FORMALDEHYDE GAS IN AN AIR-TIGHT CHAMBER.

This method has, of late years, been very popular among dentists and is efficient, provided a sufficient length of time is allowed for action.

Results of experiments.—Exposure of contaminated instruments to formaldehyde vapor in an air-tight glass jar for periods varying from 10 minutes to 1 hour gave growth more or less constantly. Some strains of staphylococci were always killed by 30 minutes' exposure; the more resistant strains survived for 60 minutes. An exposure of one and one-half to two hours killed the most resistant strain used. These results were obtained with an excess of formalin in a small glass jar closed by ground-glass joints sealed with vaselin, so the air was filled to saturation with the formaldehyde vapor.

The advantage of this method lies solely in its simplicity and ease of application.

Its disadvantages are: (a) The time required to sterilize is too long for a busy dentist; (b) formaldehyde causes quite a marked rusting of unplated steel instruments; (c) inefficiency is likely to result from the lessening of the density of formaldehyde vapor, unless special care be taken to replenish the supply of formalin solution at frequent intervals; (d) inability to remove a single instrument from the air-tight chamber without interfering decidedly with the process of sterilization, because of the lessening of the density of the formaldehyde vapor in the chamber; (e) the disagreeable odor and irritating effect on mucous membranes will be experienced more or less by both operator and patient.

OTHER CHEMICAL METHODS.

Disks containing mercuric iodide with some alkaline salt are theoretically practicable. The alkalinity is supposed to guard against the corrosive action of the mercury on the metal instruments. However, this brings a rather delicately balanced chemical reaction into use, and unless the application of the method be carried out by the

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dentist himself, or an assistant who has some knowledge of chemistry, bad results may be obtained. For instance, the chemical impurities of the water used may vary from day to day, and thus disturb the proper degree of alkalinity. No experiments were made with these disks, as it is not conceivable that their use is an improvement on some of the simpler and less technical methods.

The action of various chemical substances, such as gasoline, petroleum-ether, etc., was tried by the writer. Their efficiency is doubtful and uncertain. No sterilization was obtained except on prolonged exposure (24 hours or more).

In addition to these methods the writer tried the application of moist heat at a constant degree, lower than the boiling point; 80° was the temperature used. This was tried in order to get a method that would interfere less with the edge of cutting instruments than does boiling; also, a method that could be applied to certain instruments that could not be boiled without marked deleterious effect on them, such as dental mirrors.

A jacketed water bath, designed by Mr. W. F. Wells, which was equipped with an apparatus for maintaining a constant level of water in the jacket, was used for this purpose. The inner chamber contains a thermoregulator set at 80°. In this bath the contaminated instruments were placed for varying periods.

To alkalinize the water, 0.25 per cent sodium hydroxide was added. When once raised to 80°, the amount of gas or electric current required to maintain a bath containing 1 to 2 gallons is very small, indeed. In fact, it can be maintained at that temperature for the whole 24 hours cheaper than it can be extinguished and reheated each day.

The use of this degree of heat had no deleterious effect on metal instruments or dental mirrors after prolonged and repeated exposure. Sterilization was always obtained in three minutes, even with the most resistant strains of staphylococci used. It is thus seen that this is practically as effective as boiling, but the temperature is 20° lower. It is simple to operate when once installed and is very efficient and rapid.

As stated above, no bad effects were noted on dental mirrors or instruments. However, there was a bad effect on instruments with wooden or hard-rubber handles. In the present era, however, no instrument that is not entirely of metal has any place in the armamentarium of surgeons or dentists. There are a few exceptions to this rule, where flexibility or elasticity is a factor in the use of the instrument.

From the above experiments and considerations the methods depending upon moist heat were found to be by far the most rapid and efficient.

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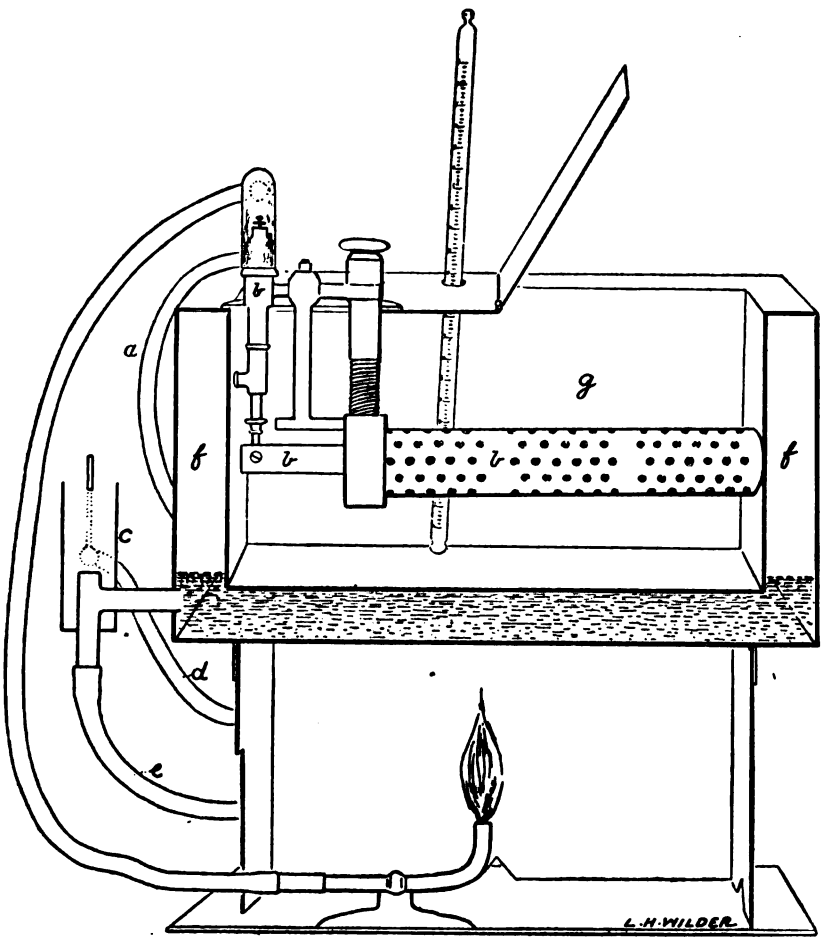
In order of merit the writer places the methods depending upon heat as the active disinfecting agent as follows:

1. Boiling for at least 10 minutes in 0.25 per cent sodium hydroxide.
2. Use of water bath at 80° for at least 10 minutes.



WATER BATH USED FOR STERILIZING INSTRUMENTS AT 80°.
a = GAS SUPPLY. b = THERMO REGULATOR. c = CONSTANT WATER-LEVEL REGULATOR. d = WATER SUPPLY. e = OVER-FLOW PIPE. f = JACKET CHAMBER. g = STERILIZING CHAMBER.

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3. Use of moist heat in free chamber (Arnold sterilizer) for at least 10 minutes after thermometer reaches 100°.
4. Submersion in boiling water for at least 10 minutes, the source of heat being removed immediately prior to submersion of the instrument.
5. Application of dry heat by passing instrument through a free flame.
6. Dry heat in closed chamber.

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The arrangement of the chemical methods in order of merit is much more difficult; in none are simplicity, efficiency, and rapidity combined as in some of the methods dependent on heat.

Using formaldehyde, the simplicity is ideal; but the length of exposure necessary to gain efficiency makes it undesirable. With phenol and other coal-tar products efficiency is good but simplicity and rapidity are partially sacrificed. With mercuric iodide, the same factors that militate against phenol, plus a possible deleterious action on the instruments, are applicable.

It is the opinion of the writer, therefore, that in selecting a method for adoption in dental offices the use of moist heat is essential. Some will offer the objection that a dentist has many instruments which will not stand such procedure. I will admit that there are, perhaps, a few instruments which can not be boiled without an injurious effect on them; but after eliminating hard rubber and wood handled instruments, which have no place in any instrument case of the present age, this list becomes very small.

I shall now consider the method of choice as applied to different instruments.

The instruments in the following list can all be boiled without marked bad effects unless the water used has some special chemical impurity which attacks the metal. Such conditions will have to be determined for each water supply and the proper remedy sought through scientific channels..

Broaches and their holders.
Burnishers.
Burrs.
Chisels.
Cone-socket instruments with metal handles.
Drills.
Excavators.
Explorers.
Files.
Forceps, extracting.
Forceps, foil.
Forceps, tongue-holding.
Impression trays.
Knives and lancets.
Mallets, automatic and hand.
Mixing slabs.
Mouth gags.
Mouthpiece of gas apparatus.
Mouthpiece of saliva ejector.
Pluggers.
Polishing points.
Pyorrhœa instruments.
Root elevators.
Rubber-dam clamps, and forceps for the same.
Rubber-dam holder (metal parts) and weights.
Saws.
Scissors.
Scalers.
Spatulas, metal.
Syringes, water.
Syringes, hypodermic.

The latter should be of glass or metal without washers; they can then be boiled repeatedly without impairing their efficiency in any way. An inferior hypodermic syringe is always unsatisfactory, whether it be sterilized or not.

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To the above list I will add the following as instruments that will stand boiling:

Chip blower.
Masks for giving nitrous oxide gas.
Wire scratch wheel for head of dental engine.
Engine hand pieces.

The wire scratch wheel on the head of the dental engine should be made entirely of metal and detachable, so that it can be easily removed and boiled. Probably a cheap bristle wheel might be made that could be discarded after each patient is treated.

Probably many will challenge the statement that engine hand pieces can be boiled. This statement is made only after having procured a right-angled hand piece, boiled the same, and tested its sterility, then contaminated it with a fluid culture of bacteria, and again boiled it and tested its sterility. After completing the experiments with it for the day it was placed in 95 per cent alcohol to remove the excess of water, and in several instances left in this fluid overnight. It has been boiled repeatedly and frequently exposed to 80° in a water bath, yet it has shown no bad effects as a result of such treatment, except the removal of the lubricant from the mechanism. It can be oiled in a few seconds and its mechanism will run as smoothly as before. These hand pieces could be made with oil holes at the proper points so that the oiling would be much facilitated.

This instrument is one which dentists have usually considered non-sterilizable, consequently it has received very little efficient sterilization. Marshall (12) states that hand pieces can be sterilized by immersing them in gasoline and then in alcohol; but my experiments with sterilization by anhydrous liquids have given disappointing results, even with instruments of simple construction. Furthermore the effect of gasoline and alcohol on the lubricant will be practically as complete a removal of the oil as when boiled, so that oiling of the piece would be necessary after each sterilization.

In sterilizing hand pieces, heat will reach infection in parts of the instrument where cold solutions can not be effective, on account of the oil present, and where gas does not penetrate. With heat, the metal itself is raised to the temperature of the surrounding medium, so that the organisms are attacked from all sides; while with solutions or gases more or less of their surface is protected.

In seeking a method of sterilization for hand pieces, several methods were tried, designed to obtain sterilization without the introduction of water into the instrument. As stated above, the gasoline method did not sterilize rapidly and completely. Immersing in a fixed oil, liquid vaseline, was then tried, placing this in a steam chamber and raising the temperature to 100° for one hour. This proved inefficient,

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because the heat is only the equivalent of 100° of dry heat, the instrument being in an anhydrous fluid. As a last resort I turned to moist heat by the method of boiling, or an 80° water bath, in 0.25 per cent sodium hydroxide and then removed the excess of water by absorbing it with alcohol. This gave the desired result.

All of the above mentioned instruments may be submitted to 80° in a water bath without any injurious effect on the instruments. Mouth mirrors may also be sterilized by this method without injuring them. This was determined by obtaining several new mirrors, contaminating them, and then placing them in 0.25 per cent sodium hydroxide solution at 80°. Sterilization was accomplished in 3 mintes, though the mirrors were frequently left in the bath for a much longer period, 10 to 60 minutes. The test of the effects of this treatment was made by handing the sterilized mirrors, together with a new mirror of the same lot that had not been sterilized, to other persons and asking them to pick out the one that had not been sterilized, Everyone acknowledged his inability to determine any difference.

Boiling, or heating to 80°, the rubber bulbs of chip blowers, and the face piece of the gas inhaler, will shorten the life of these articles. It is believed, however, that the increased expense due to these rubber fittings will not be great enough to work any hardship on the dentist. It certainly will not be as great as the cost of rubber gloves used by the average surgeon; and at present nearly every surgeon uses rubber gloves and insists on their sterilization by boiling. The dental surgeon should not be content with a lower grade of work, nor deterred by the small sum necessary to replace articles which have been worn out a little sooner by reason of improved methods in his practice.

The instruments considered above, which can be sterilized by boiling, include the greater portion of those used by the dentist; except those whose cost is so slight, or whose usefulness so impaired after using once, that they can be thrown away.

This list includes:

Polishing points and disks.
Rubber dam.
Nerve broaches (these may be sterilized by heat if desired).
Bristle brushes.

Mounted stones must be treated according to their construction and composition. Carborundum disks, wheels, and stones, which are bonded with porcelain, can be boiled without injury. Those made with rubber as the adhesive base can not be heated. Their sterilization can be accomplished by use of a phenol solution followed by alcohol. Corundum stones can not be boiled, so the phenol solution should also be used on these. Stones mounted on a mandrel by a cement or shellac can not be subjected to heat, while those

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mounted by metal devices can be boiled, provided their composition allows such treatment. Inasmuch as many of the stones and disks must be sterilized without heat, it is permissible to sterilize all stones by immersing in 5 per cent phenol solution for one hour, to be followed by immersion in alcohol to remove the excess of phenol solution.

Tortoise shell, and instruments of similar composition, which might be injured by heat, should be immersed in phenol solution, as are mounted stones. Mouth mirrors may also be sterilized in this manner, if not subjected to 80°.

The life of a mouth mirror, however, depends entirely on the efficiency of its construction in keeping fluids of any kind from the amalgam surface of the glass. As long as this can be kept dry the mirror is clear. When it becomes wet by any fluid, either water or saliva, it becomes cloudy, consequently a well-constructed mirror is the cheapest in the end.

This method may also be applied to instruments whose composition must be other than metal, on account of the discoloring effect of metal on cement, or for other good reason.

However, barring the few instruments whose chemical composition is such that a serious change in character would result from heating, all instruments should be sterilized by heat, and no instrument made of material that is destroyed by heat should be allowed in the instrument case, if the same instrument can be made of thermostabile matter.

I have seen some dental instruments with rubber handles which have been boiled repeatedly, with no bad effect except discoloration of the rubber. These, however, had a central metal shaft supporting the rubber, to prevent bending when heated. While this construction permits the boiling of rubber-handled instruments, it can not be said that rubber handles are as acceptable from an aseptic viewpoint as are all-metal instruments. Of course, instruments whose cost is so slight that they are used once and then discarded do not require sterilization to prevent transfer of infection from patient to patient.

OTHER SANITARY MEASURES.

The following suggestions relating to dental asepsis, while not strictly within the subject of sterilization of instruments, are given as contributory factors in improved office sanitation.

Cuspidors are a necessity in a dental office, and the problem of keeping them in sanitary condition is a difficult one. The installation of the fountain cuspidor has been a great improvement over the old metal or earthen bowls which were so hard to keep clean. To those dentists who still have the old type of cuspidor, on account of lack

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of running water or for other reason, I would recommend at least daily cleaning, with a broom or stiff brush and water. This is to be followed by placing the cuspidor in a bucket, covering it with boiling water, and leaving it there for at least one hour. It would be well to have several of these, so that a clean one can be put in use for each patient while the others are being cleaned by assistants or charwomen. In offices having the single-bowl fountain cuspidor, with bowl that can not be removed, flushing with hot water and antiseptic solutions is our main effort in sterilization. All fountain cuspidors should be fitted with both hot and cold water, so that the hot water can be used for cleaning the bowls after each patient is dismissed. Those having bowls that can be removed can have the bowls immersed in antiseptic solutions, or may even be boiled in a large container. However, absolute sterility of cuspidors is not of vital importance, provided a high degree of cleanliness is maintained. It is well, however, to have these articles of equipment installed so that complete sterilization can be carried out in case an unusual infection, such as diphtheria, is encountered.

The possibility of the operator transferring infection to the cable of the dental engine above the hand piece, and then later from the cable to another patient, has been mentioned. If the cables have the power-transmitting mechanism inside a covering, this can be avoided by a simple sterile or clean cotton sleeve, with a draw string in each end, which can be slipped over the cable and tied after the hand piece is in place, so that the whole cable is covered down to the sterile hand piece. This allows the operator to handle the cable at will during his operation, and, when a second patient is treated, a second clean sleeve is put on in place of the first one. It is also probable that a flexible metal covering, of tubing such as is used for conducting gas to lamps, might be constructed so that this could be removed and sterilized by heat. This is not applicable to engines which transmit the power from engine head to hand piece by open cord belt.

The use of foot levers for turning on the flow of hot and cold water in the washbowl is a great convenience to a busy operator who desires to keep his hands sterile. The use of a clean washable covering for the operating chair is a step in the direction of asepsis and cleanliness. The headrest should have a clean linen cover, renewed for each patient.

There should be toilet facilities for patients and, in addition to the usual lavatory equipment, a dental bowl, like that seen on Pullman cars, so that a patient may brush his teeth without doing so over the washbowl.

To place the patient's mouth in as clean condition as possible, each patient should brush his teeth, preferably immediately prior to

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coming to the chair. This should be followed by a thorough rinsing of the mouth with some good mouth wash. This procedure is a mechanical cleansing, aimed primarily at the removal of spores from the field of operation, though many other organisms are removed at the same time.

In order to do this the dentist should have a supply of tooth-brushes on hand and, if necessary, supply a new brush to each patient. This may be the patient's first encounter with the oral hygiene educational movement, but I believe it will be productive of good. I believe that the dentist should add the cost of the brush to the patient's bill, unless brushes can be obtained at so low a figure as to make their free distribution practicable. A supply of mouth wash should be on hand in a convenient place for use by patients.

Paper drinking cups and paper, or small individual, towels for patients should be furnished. The common drinking cup and towel are abolished on all interstate carriers, and in hotels and public places in many States. It is, therefore, fitting that the members of the medical and dental profession should apply the spirit of these laws to their own establishments, even though the letter of the law does not require it.

Clean linen direct from the laundry is not sterile, but offers only the remotest chance for transmission of infection through it. Sterile linen is desirable and for a busy dentist, apparatus for its sterilization will be a great addition to office equipment. Steam pressure sterilizers are preferable for this, though other types may be used.

SUMMARY.

As a result of the experiments and investigations detailed above the writer reaches the following conclusions and recommends the following methods for sterilization of dental instruments:

CONCLUSIONS.

1. Moist heat is our best disinfecting agent for the sterilization of all metal instruments.

2. For the destruction of nonspore-bearing bacteria, moist heat at 80° is nearly as efficient as boiling, and for practical purposes can be used in place of boiling.

3. Instruments constructed of metal, whose complicated mechanism has heretofore caused them to be considered as nonsterilizable, can be sterilized by moist heat, provided the water is removed from them by immersing in alcohol subsequent to sterilization.

4. Instruments, whose construction does not permit of boiling, can be sterilized by chemical disinfectants.

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5. There is need for more practical instruction in dental schools and clinics in the methods of sterilization, and the subsequent testing of the same by bacteriological methods.

6. Dentistry, which is a highly specialized branch of surgery, should use the two factors, asepsis and anæsthesia, which have made possible the wonders of modern surgery, with skill and precision equal to that of surgeons.

RECOMMENDATIONS.

1. That all instruments and appliances be rendered mechanically clean by washing in water with a brush or sponge.

2. That the following instruments and appliances be boiled or submitted to 80° in a slightly alkaline solution (0.25 per cent sodium hydroxide):

Artificial teeth used in matching and measuring.
Broaches and their holders.
Burnishers.
Burrs.
Chip blowers.
Chisels.
Drills.
Excavators.
Explorers.
Files.
Forceps, extracting.
Forceps, foil.
Hand pieces for engine.
Impression trays.
Knives and lancets.
Mallets, hand and automatic.
Mixing slabs.
Mouth gags.
Mouthpiece of saliva ejector.
Pliers.
Pluggers.
Pyorrhœa instruments.
Polishing points and brushes (if not discarded after using once).
Reamers.
Root elevators.
Rubber dam clamps and forceps for same.
Rubber dam weights and metal parts of holder.
Saws.
Scalers.
Scissors.
Scratch wheel on head of engine.
Spatulas, metal.
Syringes, hypodermic.
Syringes, water.
Tongue-holding forceps.
Mirrors (if 80° bath be used, but not to be boiled).

3. That instruments in the above list whose mechanical construction makes it difficult to remove the excess of water are to be placed in 95 per cent alcohol for 10 minutes to remove water, then removed and allowed to dry.

4. That only instruments with metal handles be used by dentists desiring to follow this method.

5. That the following instruments be sterilized by immersion in 5 per cent solution of phenol for at least 60 minutes:

Mounted stones.
Tortoise-shell instruments.
Mirrors (when 80° bath is not used).
Other instruments not of metallic nature and which can not be replaced by metallic instruments.

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6. That instruments, after using, be placed in a fluid medium, preferably clean water, to avoid drying of infectious material and to facilitate their mechanical cleansing.

7. That no instrument or appliance, used on a patient directly or indirectly, be used on any other patient until recommendations 1 and 2, or 1 and 5, as the case may be, have been complied with.

BIBLIOGRAPHY.

1. Francis, E. Laboratory studies upon Tetanus. (Hyg. Lab. Bull. No. 91, p. 70.)
2. Sternberg, George M. Text Book of Bacteriology, 1901.
3. McFarland, Joseph. Text Book upon the Pathogenic Bacteria, 1909.
4. Muir and Ritchie. Manual of Bacteriology, 1907.
5. Park and Williams. Pathogenic Microorganisms, 1914.
6. Hiss and Zinsser. Text Book of Bacteriology, 1914.
7. Jordan, Edwin O. General Bacteriology, 1909.
8. Abbott, A. C. Principles of Bacteriology, 1901.
9. Rosenau, M. J. Disinfection and Disinfectants, 1902.
10. ———. Hygiene and Preventive Medicine, 1912.
11. Phelps, Earle B. J. Infect. Dis., Chicago, 1911, 8:27.
12. Marshall, J. M. Items of Interest, New York, 1912, 35:765.

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V.—A MODIFICATION OF ROSE'S METHOD FOR THE ESTIMATION OF PEPSIN.[1]

By MAURICE H. GIVENS, *Assistant Biochemist, United States Public Health Service.*

In spite of all the work that has been done to isolate pepsin in a pure condition the results have been negative; for this reason it is as yet impossible to offer a method for its quantitative determination. As a matter of fact, while a number of so-called quantitative methods have been devised, the results obtained are only of value from a comparative standpoint. Such comparisons, however, are of decided importance and any means which will further their approach to a standard basis are worthy of consideration. It is with this view that a modification of Rose's method is here offered.

It is not necessary to review all of the many methods proposed for the estimation of pepsin. Suffice it to say that those of Mett (1), Jacoby-Solms (2), and Rose (3) are most used. Each has certain advantages at once apparent to a worker, but the rapidity and ease of the latter method, with the modification here offered, would seem to warrant its use. The Mett method has been in use so long that it is not necessary to describe the procedure. That of Jacoby depends on the digestion of a 0.5 per cent solution of ricin in 5 per cent sodium chloride, at 37° C. for three hours, with varying amounts of a $\frac{1}{100}$ diluted gastric juice. Rose's method demands the digestion of a 0.25 per cent solution of pea globulin in 10 per cent sodium chloride, at 37° C. for one hour or at 50° to 52° C. for 15 minutes, with varying amounts of a previously neutralized gastric juice usually diluted five times.

Against the use of both the Mett and the Jacoby methods can be offered at once the consumption of time, not to mention other factors. It is not always possible to get ricin and this led us to use the Rose method. It does not seem justifiable, however, to neutralize the gastric contents as Rose does. He lays much stress upon this point and says the failure to neutralize is a serious objection to the Jacoby method. He thinks the final acidity in each tube should be the same. In so neutralizing the method is rendered unreliable. Evidence is offered in the present paper sustaining this proposition and a correction is made.

[1] Manuscript submitted for publication Apr. 19, 1915.

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Rose's complete method follows:

0.25 gram globulin of the pea prepared as described * * * is dissolved in 100 c. c. of 10 per cent sodium chloride (by warming slightly if necessary) and filtered. Portions of the clear filtrate of 1 c. c. each are introduced into a series of 11 small test tubes about 1 cm. in diameter. To each tube is added 1 c. c. of 0.6 per cent hydrochloric acid, and about five minutes are allowed for the development of the turbidity. A measured volume of the stomach contents is then exactly neutralized to litmus paper with dilute alkali. If a precipitate of acid protein forms, this is filtered off, and the clear neutral solution is diluted a known number of times (usually five) with distilled water, allowance being made for the dilution of neutralization. A portion of the diluted juice is boiled, and amounts decreasing by 0.1 c. c. added to the tubes of turbid protein; to the first, 1.0 c. c.; to the second, 0.9 c. c.; to the third, 0.8 c. c.; and so on to the eleventh, to which none is added. The unboiled juice is then rapidly added in increasing amounts, as follows: To the first, none; to the second, 0.1 c. c.; to the third, 0.2 c. c.; to the fourth, 0.3 c. c.; to the fifth, 0.4 c. c.; to the sixth, 0.5 c. c.; to the seventh, 0.6 c. c.; to the eighth, 0.7 c. c.; to the ninth, 0.8 c. c.; to the tenth; 0.9 c. c.; and to the eleventh, 1.0 c. c. Each of the tubes thus has a total volume of 3.0 c. c.; and a total acidity of 0.2 per cent of hydrochloric acid. * * *

The measurements of the solutions may be easily and accurately made with a pipette of 1 c. c. capacity, graduated to 0.01 c. c. The tubes are well shaken and allowed to stand in a thermostat or water bath for 15 minutes at a temperature of 50° to 52° C. Exactly the same endpoint is obtained by keeping the tubes at a temperature of 35° to 36° C. for one hour. At the end of the digestion time that tube in the series is selected which contains the least amount of gastric juice and which exhibits no turbidity. The peptic activity is calculated on the basis of the amount of gastric juice in this tube. The enzyme content is expressed by the number of cubic centimeters of the 0.25 per cent globulin that would be digested by 1 c. c. of the undiluted gastric juice under examination, if the activity were exerted for a period of one hour at 35° to 36° C., or for 15 minutes at 50° to 52° C. For example, if 0.5 c. c. of a gastric juice diluted five times clears up 1 cubic centimeter of the 0.25 per cent globulin solution in 15 minutes at the given temperature, the activity of the solution would be expressed:

$$\text{Peptic activity} = (1 + 0.5) \times 5 = 10.$$

For clinical purposes it suffices to use the scale of pepsin units here proposed, which gives figures about one tenth of those expressed on the Jacoby-Solms scale.

Rose further states:

In the above method the conditions are constant in every trial, in respect to acidity, volume, protein content, and temperature.

This statement is true enough, but in attaining this point it is necessary first to neutralize, and in so doing a grave error is made. The effect upon pepsin of alkalis, even in dilution, is a question about which there is no dissention. Even very dilute alkalis will inhibit, if not destory, the action of pepsin. The following experiment brings out the point: A 0.1 per cent solution of scale pepsin was made containing 77.0 c. c. N/14 hydrochloric acid. 1 c. c. of this solution was exactly neutralized with 0.77 c. c. N/14 sodium hydroxide and diluted to 10. Another 1 c. c. portion, without neutralization, was diluted to 10. Both were now subjected to digestion at 50° to 52° C. for 15 minutes, as follows:

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Pepsin solution.

	Neutralized tubes.[1]					Unneutralized tubes.[2]				
	1	2	3	4	5	1	2	3	4	5
0.25 per cent pea globulin	1	1	1	1	1	1	1	1	1	1
0.6 per cent HCl	1	1	1	1	1	1	1	1	1	1
Distilled water	0.9	0.7	0.5	0.2	0.0	0.9	0.7	0.5	0.2	0.0
10×diluted pepsin	0.1	0.3	0.5	0.8	1.0	0.1	0.3	0.5	0.8	1.0

[1] No perceptible digestion in any.
[2] Complete digestion in 3, 4, and 5. Pepsin=(1+0.5)×10=20.
Controls: Boiled pepsin+globulin+acid=negative. Water+globulin+acid=negative.

In the above case it is evident that the greatest part of the pepsin has been destroyed or inhibited. All of the pepsin has not necessarily been destroyed but evidently enough to prevent digestion within the limit of time and temperature. If more pepsin and less acid were present, then after neutralization one would expect to find some pepsin. It seems that an enzyme is not destroyed immediately, in the way an acid solution can be neutralized. In neutralization of weak acid solutions with alkali as dilute as N/14 sodium hydroxide, there is no question but that, for the moment, there is an alkaline reaction at the point of contact with the alkali. Since this is true, if we partially neutralize a weak acid solution containing pepsin, there ought to be a reduction of pepsin. About the effect of alkalis on pepsin there can be no question; hence the above assumption is supported by the following experiment: Gastric contents were removed from two normal individuals, after an Ewald test meal, and these determinations made:

	Total acidity.	Free acidity.	Rose exact.	Proposed method.	Jacoby exact.	Jacoby neutralized.	Neutralized one-half, then Rose.
R.....	55	42	Trace.	41	100	Trace.	16
M.....	60	45	Trace.	41	100	Trace.	16

Goodman (4), working with the Jacoby method, concluded from a limited number of cases that a uniform acidity was not necessary. Rose takes exception to this and demands for his method a final uniform acidity. He states—

> It will be seen that the enzyme content is expressed by much larger numbers when the total acidity is 0.05 per cent of hydrochloric acid than when it is 0.2 per cent. This is not due to the greater activity of the pepsin under such conditions, but to the decreased turbidity of the globulin solution, resulting from the decreased acidity.

In part I can agree with him, but I do not see that this justifies the neutralization of the stomach contents under examination. His statement is true if the final acidity is low, but if 1 c. c. of 0.6 per cent

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hydrochloric acid be added, then the additional acidity, present by virtue of that contained in the gastric contents, can have no influence on the turbidity, and hence is not misleading as to enzymolysis. The following typical experiment illustrates the point:

	Tubes.												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1 c. c. of per cent HCl....	0.6	0.3	0.15	0.075	0.0375	0.0187	0.0093	0.0046	0.0023	0.0012	0.0006	0.0003	H_2O
1 c. c. of 0.25 per cent pea globulin.....	1	1	1	1	1	1	1	1	1	1	1	1	1
Final total acidity, per cent.....	0.3	0.15	0.075	0.0375	0.0187	0.0093	0.0046	0.0023	0.0012	0.0006	0.0003	0.0001	0.0

These tubes were allowed to stand 15 minutes, and at the end of that time tubes 1, 2, 3, 4, and 5 showed the same maximum turbidity, so far as perceptible to the naked eye. Tubes 6, 7, and 8 showed no maximum and progressively less turbidity. Tubes 9 to 13 were all clear, not even showing an opalescence. The same result was obtained at the end of an hour. To another series, with the above result at the end of 15 minutes, was added 1 c. c. of 0.6 per cent hydrochloric acid; after 10 minutes, all the tubes showed a maximum turbidity, with no perceptible difference between them. That is to say, if the final total acidity is only 0.2 per cent, or increased to even 0.4 per cent, there is no apparent difference in the turbidity of the tubes. This certainly shows, from the standpoint of turbidity, that it is unnecessary first to neutralize the gastric contents. Even were the total acidity of a gastric juice under examination 100 to 120, the final total acidity of the tube containing the greatest amount of diluted gastric juice would never reach 0.4 per cent.

In a series of 24 observations (Table I) on normal and pellagrous individuals, there are only two instances in which a value has been obtained by following exactly Rose's method. Strict attention has been paid to neutralization. Titrations have first been made with alizarin red and phenolphthalein. The first tinge of brown with alizarin red reacted neutral to litmus. In other instances the contents have been titrated to the first perceptible tinge of pink with phenolphthalein, and then, for the Rose method, another sample was made neutral to litmus by stopping short of this point. In no case has the reaction been alkaline.

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TABLE I.

Case.	Total acidity.	Free acidity.	Pepsin number.		Remarks.
			Proposed method.	Rose method.	
1	91	70	50	Trace.	Normal.
2	60	45	41	Trace.	Do.
3	44	21	31	Trace.	Do.
4	61	44	41	12	Do.
5	83	67	41	Trace.	Do.
6	84	69	41	Trace.	Do.
7	61	46	25	Trace.	Do.
8	55	42	41	Trace.	Do.
9	71	49	41	Trace.	Do.
10	89	70	40	Trace.	Do.
11	69	49	42	Trace.	Do.
12	51	26	42	Trace.	Do.
13	58	42	42	Trace.	Do.
14	71	53	40	Trace.	Do.
15	78	64	33	12	Pellagra.
16	25	12	33	Trace.	Do.
17	76	57	41	Trace.	Do.
18	57	38	40	Trace.	Do.
19	45	25	25	Trace.	Do.
20	84	64	31	Trace.	Do.
21	56	31	21	Trace.	Do.
22	21	0	Trace.	0	Do.
23	35	7	12.5	0	Do.
24	14	0	Trace.	0	Do.

No attempt is made in this paper to take up the question of gastric digestion in pellagra.

That neutralization in the Jacoby method will in a like manner destroy or inhibit some of the pepsin, and consequently influence the results appears from the following:

Unneutralized juice.		Neutralized juice.		Remarks.
Proposed method.	Jacoby method.	Rose method.	Jacoby method.	
41	100	Trace.	Trace.+	Normal.
41	100	Trace.	Trace.+	Do.
41	100	Trace.	Trace.+	Do.
41	83	Trace.	Trace.+	Pellagra.

The following method has been adopted in this laboratory.[1] The gastric contents are strained through cheesecloth. Two c. c. are measured by means of an Ostwald pipette into a 25 c. c. stoppered volumetric cylinder, and diluted to the mark with distilled water. Into each of seven small test tubes (1 × 10 cm.) is measured, with an Ostwald pipette, 1 c. c. of a 0.25 per cent filtered pea globulin in 10 per cent sodium chloride solution. To each tube is added 1 c. c. of 0.6 per cent hydrochloride acid, also by means of an Ostwald pipette. The tubes are allowed to stand about 5 minutes, until the maximum turbidity develops. To the first five, distilled water is added as fol-

[1] I take pleasure in here thanking Dr. R. C. Lewis of the staff for the preparation of pea globulin used in these experiments.

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lows: To the first, 0.9 c. c.; to the second, 0.8 c. c.; to the third, 0.7 c. c.; to the fourth, 0.6 c. c.; and to the fifth, 0.2 c. c.; to the sixth and seventh, none. Then there are rapidly added to each test tube the following amounts of the 1/12.5 gastric juice; to the first, 0.1 c. c.; to the second, 0.2 c. c.; to the third, 0.3 c. c.; to the fourth, 0.5 c. c.; to the fifth, 0.8 c. c.; to the sixth, 1.0 c. c.; and to the seventh, 1.0 c. c. of the diluted juice boiled. These measurements can be accurately made with a 1 c. c. pipette graduated in 0.01 c. c. All tubes are then immersed for 15 minutes in a water bath at 50° to 52° C. At the end of this time, the tube is selected which is clear and contains the least amount of diluted gastric juice. Upon this basis, the peptic activity is calculated as the number of c. c. of 0.25 per cent globulin digested by 1 c. c. of undiluted gastric juice. For example, if tube 2 containing 0.3 c. c. of a 12.5 times diluted juice be clear, then the result would be expressed:

$$\text{Peptic activity} = (1 \div 0.3) \times 12.5 = 41.2.$$

Ordinarily this scheme of seven tubes is used, though it is not a rule. If the free acidity be high, sometimes a dilution of 1/25 is made. The number of tubes used will depend upon the accuracy desired.

	Tubes.						
	1	2	3	4	5	6	7
0.25 per cent pea globulin c. c.	1	1	1	1	1	1	1
0.6 per cent HCl c. c.	1	1	1	1	1	1	1
Distilled water, c. c.	0.9	0.8	0.7	0.5	0.2	0.0	0.0
Diluted gastric juice	0.1	0.2	0.3	0.5	0.8	1.0	0.0
Boiled gastric juice	0	0	0	0	0	0	1.0
Final volume, c. c.	3	3	3	3	3	3	3
Peptic activity	125	62.5	41	25	17	12.5	0

The gastric contents are never filtered, but strained through cheesecloth, as it is believed in this way less enzyme is adsorbed. The dilution has been kept at ten times, or greater, and water substituted for boiled juice to make up the final volume. This has been done in line with Nierenstein and Schiff's[7] procedure, in order to lessen the amount of disturbing factors, be they proteoses, peptones, or antiferments. At the same time it serves in keeping the final total acidity nearer 0.2 per cent than if boiled unneutralized juice were added.

The pea globulin is made according to Rose's description from the ordinary garden pea, *Pisum sativum:*

The finely ground peas, freed as much as possible from the outer coating, are repeatedly extracted with large quantities of 10 per cent sodium chloride solution, the extracts combined, strained through fine bolting cloth, and allowed to stand overnight in large cylinders to deposit insoluble matter. The supernatant fluid is siphoned

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off and saturated with ammonium sulphate. The precipitate of albumins and globulins is filtered off, suspended in a little water, and dialyzed in running water for three days, until the salt has been removed and the albumins have been dissolved. The globulins are filtered off and washed two or three times with water, to remove the last trace of albumins. To purify further, the precipitate is extracted with 10 per cent sodium chloride solution and filtered until perfectly clear. The resulting solution is exactly neutralized to litmus paper, by the cautious addition of dilute sodium hydroxide, and again dialyzed in running water for three days to remove the salts completely. The precipitated globulins are then filtered off and dried on a water bath at 40° C. During the complete process of separation, the proteins should be preserved with a mixture of alcoholic thymol and toluene. The globulins so prepared dissolve, practically completely, in 10 per cent sodium chloride solution, and after slight acidification with hydrochloric acid yield a turbid solution which does not settle out on standing.

I have found this solution of globulin to settle out slightly in the case of controls, though as a rule it remains in suspension and certainly is much better than the precipitated ricin, which will settle out and rise to the top of the tubes. If preserved, as Rose directs, with toluene, it can be kept for a month or more. On the assumption that exact neutralization only inactivated the pepsin, and that it might be reactivated at once, though this is not possible according to Tichomirow (5), the following experiment was tried: Some gastric juice was neutralized exactly to litmus with N/14 sodium hydroxide and at once the previously determined acidity was attained by adding N/14 hydrochloric acid. This juice was then subjected to the determination and no quantitative amount of pepsin found, while with the unneutralized juice there was a peptic value of 40. The pepsin can be determined in 25 minutes from the time the gastric contents are received, provided there are on hand stock solutions of pea globulin and 0.6 per cent hydrochloric acid. Using a burette to deliver the globulin solution, the 0.6 per cent hydrochloric acid, and the water, and graduated pipettes for the diluted juice, six determinations can be completed easily in an hour and a half.

The present method is recommended because it is believed to be as accurate as any and less time consuming. That it will check itself is shown by the following analyses on the same normal individual on different days:

Total acidity.	Free acidity.	Pepsin number.	Contents removed after—
			Minutes.
61	46	25	30
46	21	31	45
61	44	41	60
55	42	41	60
71	49	41	60
89	70	40	60
83	67	41	75
84	69	41	90

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The low value (25) found above I believe is due to the fact that only 30 minutes elapsed after the giving of the test meal, as Hawk (6) and his collaborators have found that the height of acid and pepsin secretion is not reached in that time. The high value (50) found (see Table I) in a normal individual may be due to a hypersecretion of pepsin, called forth by the high acidity (90). On the following day the same case with a total acidity of 60 showed a peptic value of 41. The limit for normal individuals found so far extends between 25 and 50. The following table gives a comparison of the results obtained on the same contents, by the proposed method and by that of Jacoby:

Case.	Total acidity.	Free acidity.	Pepsin number.		Remarks.
			Proposed method.	Jacoby method.	
1	51	26	42	100–	Normal.
2	55	42	41	100–	Do.
3	58	42	42	100–	Do.
4	60	45	41	100–	Do.
5	69	49	42	100–	Do.
6	71	49	41	100–	Do.
7	71	53	40	100–	Do.
8	89	70	40	100–	Do.
9	56	31	21	60–80	Pellagra.
10	57	38	40	100–	Do.
11	69	53	33	100–	Do.
12	84	64	31	100–	Do.

By "100–" is meant that the solution is almost clear, only a trace of turbidity being left, the tube containing the next higher concentration of gastric content being clear; therefore it is more exact to say "100–." From this table it is seen that the values obtained by my method correspond to about four-tenths of those of Jacoby-Solms.

BIBLIOGRAPHY.

1. Mett, S. G.
2. Solms, Eugen. Ztschr. f. klin. Med. 1907, v. 64, p. 159.
3. Rose, William C. Arch. Int. Med. 1910, v. 5, p. 459.
4. Goodman, Edward H. Am. J. M. Sc. 1908, v. 136, p. 734.
5. Tichomirow, N. P. Ztschr. f. physiol. Chem. 1908, v. 55, p. 107.
6. Bergeim, Rehfuss, and Hawk. J. Biol. Chem. 1914, v. 19, p. 345.
7. Nirenstein and Schiff. Arch. f. verdauungskrankheiten. 1902. v. 8, p. 559. Berlin klin. Wochenschr. 1903. p. 268.

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HYGIENIC LABORATORY BULLETINS OF THE PUBLIC HEALTH SERVICE.

The Hygienic Laboratory was established in New York, at the Marine Hospital on Staten Island, August, 1887. It was transferred to Washington, with quarters in the Butler Building, June 11, 1891, and a new laboratory building, located in Washington, was authorized by act of Congress March 3, 1901.

The following *bulletins* [Bulls. Nos. 1–7, 1900 to 1902, Hyg. Lab., U. S. Mar.-Hosp. Serv., Wash.] have been issued:

*No. 1.—Preliminary note on the viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 2.—Formalin disinfection of baggage without apparatus. By M. J. Rosenau.

*No. 3.—Sulphur dioxid as a germicidal agent. By H. D. Geddings.

*No. 4.—Viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 5.—An investigation of a pathogenic microbe (*B. typhi murium* Danyz) applied to the destruction of rats. By M. J. Rosenau.

*No. 6.—Disinfection against mosquitoes with formaldehyde and sulphur dioxid. By M. J. Rosenau.

†No. 7.—Laboratory technique: Ring test for indol, by S. B. Grubbs and Edward Francis; Collodium sacs, by S. B. Grubbs and Edward Francis; Microphotography with simple apparatus, by H. B. Parker.

By act of Congress approved July 1, 1902, the name of the "United States Marine-Hospital Service" was changed to the "Public Health and Marine-Hospital Service of the United States," and three new divisions were added to the Hygienic Laboratory.

Since the change of name of the service the bulletins of the Hygienic Laboratory have been continued in the same numerical order, as follows:

*No. 8.—Laboratory course in pathology and bacteriology. By M. J. Rosenau. (Revised edition, March, 1904.)

†No. 9.—Presence of tetanus in commercial gelatin. By John F. Anderson.

*No. 10.—Report upon the prevalence and geographic distribution of hookworm disease (uncinariasis or anchylostomiasis) in the United States. By Ch. Wardell Stiles.

*No. 11.—An experimental investigation of *Trypanosoma lewisi*. By Edward Francis.

*No. 12.—The bacteriological impurities of vaccine virus; an experimental study. By M. J. Rosenau.

*No. 13.—A statistical study of the intestinal parasites of 500 white male patients at the United States Government Hospital for the Insane; by Philip E. Garrison, Brayton H. Ransom, and Earle C. Stevenson. A parasitic roundworm (*Agamomermis culicis* n. g., n. sp.) in American mosquitoes (*Culex sollicitans*); by Ch. Wardell Stiles. The type species of the cestode genus *Hymenolepis*, by Ch. Wardell Stiles.

*No. 14.—Spotted fever (tick fever) of the Rocky Mountains; a new disease. By John F. Anderson.

*No. 15.—Inefficiency of ferrous sulphate as an antiseptic and germicide. By Allan J. McLaughlin.

*No. 16.—The antiseptic and germicidal properties of glycerin. By M. J. Rosenau.

*No. 17.—Illustrated key to the trematode parasites of man. By Ch. Wardell Stiles.

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*No. 18.—An account of the tapeworms of the genus *Hymenolepis* parasitic in man, including reports of several new cases of the dwarf tapeworm (*H. nana*) in the United States. By Brayton H. Ransom.

*No. 19.—A method for inoculating animals with precise amounts. By M. J. Rosenau.

*No. 20.—A zoological investigation into the cause, transmission, and source of Rocky Mountain "spotted fever." By Ch. Wardell Stiles.

*No. 21.—The immunity unit for standardizing diphtheria antitoxin (based on Ehrlich's normal serum). Official standard prepared under the act approved July 1, 1902. By M. J. Rosenau.

*No. 22.—Chloride of zinc as a deodorant, antiseptic, and germicide. By T. B. McClintic.

*No. 23.—Changes in the pharmacopœia of the United States of America. Eighth Decennial Revision. By Reid Hunt and Murray Galt Motter.

No. 24.—The international code of zoological nomenclature as applied to medicine. By Ch. Wardell Stiles.

*No. 25.—Illustrated key to the cestode parasites of man. By Ch. Wardell Stiles.

*No. 26.—On the stability of the oxidases and their conduct toward various reagents. The conduct of phenolphthalein in the animal organism. A test for saccharin, and a simple method of distinguishing between cumarin and vanillin. The toxicity of ozone and other oxidizing agents to lipase. The influence of chemical constitution on the lipolytic hydrolysis of ethereal salts. By J. H. Kastle.

*No. 27.—The limitations of formaldehyde gas as a disinfectant with special reference to car sanitation. By Thomas B. McClintic.

*No. 28.—A statistical study of the prevalence of intestinal worms in man. By Ch. Wardell Stiles and Philip E. Garrison.

*No. 29.—A study of the cause of sudden death following the injection of horse serum. By M. J. Rosenau and John F. Anderson.

†No. 30.—I. Maternal transmission of immunity to diphtheria toxine. II. Maternas transmission of immunity to diphtheria toxine and hypersusceptibility to horse serum in the same animal. By John F. Anderson.

†No. 31.—Variations in the peroxidase activity of the blood in health and disease. By Joseph H. Kastle and Harold L. Amoss.

†No. 32.—A stomach lesion in guinea pigs caused by diphtheria toxine and it. bearing upon experimental gastric ulcer. By M. J. Rosenau and John F. Andersonl

*No. 33.—Studies in experimental alcoholism. By Reid Hunt.

†No. 34.—I. *Agamofilaria georgiana* n. sp., an apparently new roundworm parasite from the ankle of a negress. II. The zoological characters of the roundworm genus *Filaria* Mueller, 1787. III. Three new American cases of infection of man with horsehair worms (species *Paragordius varius*), with summary of all cases reported to date. By Ch. Wardell Stiles.

†No. 35.—Report on the origin and prevalence of typhoid fever in the District of Columbia. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle. (Including articles contributed by Ch. Wardell Stiles, Joseph Goldberger, and A. M. Stimson.)

†No. 36.—Further studies upon hypersusceptibility and immunity. By M. J. Rosenau and John F. Anderson.

†No. 37.—Index-catalogue of medical and veterinary zoology. Subjects: Trematoda and trematode diseases. By Ch. Wardell Stiles and Albert Hassall.

No. 38.—The influence of antitoxin upon post-diphtheritic paralysis. By M. J. Rosenau and John F. Anderson.

†No. 39.—The antiseptic and germicidal properties of solutions of formaldehyde and their action upon toxines. By John F. Anderson.

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†No. 40.—1. The occurrence of a proliferating cestode larva (*Sparganum proliferum*) in man in Florida, by Ch. Wardell Stiles. 2. A reexamination of the type specimen of *Filaria restiformis* Leidy, 1880=*Agramomermis restiformis*, by Ch. Wardell Stiles. 3. Observations on two new parasitic trematode worms: *Homalogaster philippinensis* n. sp., *Agamodistomum nanus* n. sp., by Ch. Wardell Stiles and Joseph Goldberger. 4. A reexamination of the original specimen of *Tænia saginata abietina* (Weinland, 1858), by Ch. Wardell Stiles and Joseph Goldberger.

†No. 41.—Milk and its relation to the public health. By various authors.

†No. 42.—The thermal death points of pathogenic microorganisms in milk. By M. J. Rosenau.

†No. 43.—The standardization of tetanus antitoxin (an American unit established under authority of the act of July 1, 1902). By M. J. Rosenau and John F. Anderson.

No. 44.—Report No. 2 on the origin and prevalence of typhoid fever in the District of Columbia, 1907. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle.

†No. 45.—Further studies upon anaphylaxis. By M. J. Rosenau and John F. Anderson.

No. 46.—*Hepatozoon perniciosum* (n. g., n. sp.); a hæmogregarine pathogenic for white rats; with a description of the sexual cycle in the intermediate host, a mite (*Ielaps echidninus*). By W. W. Miller.

No. 47.—Studies on Thyroid: I. The relation of iodine to the physiological activity of thyroid preparations. By Reid Hunt and Atherton Seidell.

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No. 49.—Digest of comments on the United States pharmacopœia. Eighth decennial revision for the period ending December 31, 1905. By Murray Galt Motter and Martin I. Wilbert.

No. 50.—Further studies upon the phenomenon of anaphylaxis. By M. J. Rosenau and John F. Anderson.

No. 51.—Chemical tests for blood. By Joseph H. Kastle.

No. 52.—Report No. 3 on the origin and prevalence of typhoid fever in the District of Columbia (1908). By M. J. Rosenau, Leslie L. Lumsden, and Joseph H. Kastle.

No. 53.—The influence of certain drugs upon the toxicity of acetanilide and antipyrine. By Worth Hale.

No. 54.—The fixing power of alkaloids on volatile acids and its application to the estimation of alkaloids with the aid of phenolphthalein or by the Volhard method. By Elias Elvove.

No. 55.—Quantitative pharmacological studies; adrenalin and adrenalin-like bodies. By W. H. Schultz.

No. 56.—Milk and its relation to the public health. (Revised edition of Bulletin No. 41.) By various authors.

No. 57.—I. The presence of tubercle bacilli in the circulating blood in clinical and experimental tuberculosis. By John F. Anderson. II. The viability of the tubercle bacillus. By M. J. Rosenau.

No. 58.—Digest of comments on the pharmacopœia of the United States of America (eighth decennial revision) and the national formulary for the period ending December 31, 1906. By Murray Galt Motter and Martin I. Wilbert.

No. 59.—The oxidases and other oxygen catalysts concerned in biological oxidations. By Joseph Hoeing Kastle.

No. 60.—A study of the anatomyof Watsonius (n. g.), Watsoni of man, and of 19 allied species of mammalian trematode worms of the superfamily *Paramphistomoidea* By Ch. Wardell Stiles and Joseph Goldberger.

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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

HYGIENIC LABORATORY—BULLETIN No. 102
FEBRUARY, 1914

I. DIGITALIS STANDARDIZATION. THE PHYSIOLOGICAL EVALUATION OF FAT-FREE DIGITALIS AND COMMERCIAL DIGITALIN

By GEORGE B. ROTH

II. PRELIMINARY OBSERVATIONS OF METABOLISM IN PELLAGRA

By ANDREW HUNTER, MAURICE H. GIVENS, and ROBERT C. LEWIS

WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

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I. DIGITALIS STANDARDIZATION—THE PHYSIOLOGICAL EVALUATION OF FAT-FREE DIGITALIS AND COMMERCIAL DIGITALIN.[1]

By GEORGE B. ROTH.

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REVIEW OF RECENT LITERATURE.

Although attention has been called repeatedly to the fact that great variation exists in the activity of the various digitalis preparations on the market, little of practical value has been accomplished to remedy this condition. It was shown by Edmunds, 1907, that 17 tinctures of digitalis which he examined varied in activity as much as 400 per cent. Cushny is reported (Anon., 1912) to have examined two tinctures of digitalis and to have found one to be four times as strong as the other. Stewart, 1912, assayed 51 samples of tincture of digitalis and found a variation of from 30 to 443 per cent in their activity. It would seem, therefore, that in five years no marked advance was made toward the production of a uniform preparation of tincture of digitalis. While in the last half decade much work has been done to correct this state of affairs, a perusal of the following abstracts from the literature will show that but little real progress has been made.

CHEMICAL INVESTIGATIONS.

Since the researches of Schmiedeberg, Kiliani, and other early workers very little has been done upon the isolation of the several constituents of digitalis. Schmiedeberg (Kobert, 1906) found that from fresh digitalis leaves at least three active glucosides could be obtained, namely, digitoxin, digitalin, and digitalein. The first-mentioned glucoside, digitoxin, is practically insoluble in water but easily soluble in alcohol. It is the most highly active of the glucosides and can be broken up by acids into digitoxigenin and digitoxose. According to Kiliani (Kobert, 1906) it has the formula $C_{34}H_{54}O_{11}$.

"Digitalin" is a term which is used in a broad sense to denote a variety of substances, whereas in a restricted sense it is used to designate the true digitalin, or crystallized digitalin of Kiliani, which has the formula $C_{35}H_{56}O_{14}$.

[1] Manuscript submitted for publication June 30, 1915.

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Digitalin is easily soluble in alcohol and very slightly soluble in water. According to Kiliani, digitalin is broken up by boiling with weak acids into digitaligenin and two sugars, glucose and digitalose. True digitalin is found in larger quantities in the seeds than in the leaves.

Digitalein is a water-soluble glucoside, found in both the leaves and seeds of digitalis. Schmiedeberg considered it a pure substance, while Kiliani looked upon it as a mixture. In addition to these three glucosidal substances, another body called digitonin is contained in digitalis. It is due to the saponin-like body, digitonin, that aqueous solutions of digitalis leaves contain the water-insoluble substances, digitalin and digitoxin. Commercial preparations of digitalein are said to be especially rich in digitonin.

The recent work of Kraft, 1912, on the chemistry of digitalis differs somewhat from the work of previous investigators. Kraft, 1912, working with digitalis leaves, isolated their water-soluble and alcohol-soluble constituents. From the watery extract, he separated a glucoside which he named "gitalin," and a saponin body, digitsaponin. The glucoside gitalin he considered a purified digitalein. Gitalin is an amorphous, white powder which is neutral in reaction and is soluble in 600 parts of cold water, and in chloroform in all proportions. It melts at 150°–155° C. The hydrate of gitalin $C_{28}H_{48}O_{10}+4H_2O$, which melts at 75° C., can be easily formed from it. It is less soluble in water than gitalin, requiring about 300 parts for its solution. The yield of gitalin amounts to about 0.7 per cent. Gitalin is very sensitive to heat and reagents, and is easily transformed into the stable anhydrogitalin. The decomposition product, anhydrogitalin, is a glucoside, first described by Kraft, which by hydrolysis is decomposed into anhydrogitaligenin and digitoxose. It is therefore chemically related to digitoxin. The saponin body, digitsaponin, is an amorphous body which is identical with the amorphous digitonin of Schmiedeberg. It differs, however, from Kiliani's crystallized digitonin.

From the alcoholic-soluble extract from the leaves, Kraft was able to separate the active glucoside digitoxin, in small amount only, and a new glucoside which he named "gitin." The digitoxin was wholly insoluble in water. Kraft considers the so-called digitoxin, obtained by the chemical treatment of the leaves according to Keller's method, to be composed principally of gitalin together with a little digitoxin.

Gitin is a new crystallizable glucoside which is related to the crystalline digitonin, isolated by Kiliani from digitalis seeds. It can be hydrolyzed into digitogenin and galactose.

Kiliani, 1914, considers Kraft's "gitalin" to be a mixture, rather than a pure substance, and he has resolved it into several substances differing in their physiological action and chemical behavior.

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Rosenthaler, 1914, carried out both chemical and physiological experiments with the gitalin of Kraft and arrived at conclusions similar to those of Kiliani, namely, that gitalin was not a definite substance and that it could be resolved into constituents having unlike chemical and physiological properties.

Windaus and Schneckenburger, 1913, have succeeded in isolating a new digitalis glucoside which they have named "gitonin." It is an amorphous glucoside which is present in commercial digitonin. From Merck's digitonin a yield varying from 5 to 14 per cent could be obtained.

A new substance, digin, which resembled Kraft's gitin, was isolated by Tambach, 1912, from digitalis leaves. Physiologically it may be classed with those constituents of digitalis which have little effect upon the heart.

What was considered an attempt to discover the real active principle of *Digitalis purpurea* was undertaken by Kolipinski, 1913, and resulted in the isolation of an acid resin which he named "digitalic acid." He was of the opinion that the green color of the leaf is due to this acid resin, a body usually confounded with chlorophyll and formerly said to be inert. Digitalic acid was thought by him to be the mother substance of the various digitalis principles, namely, digitalin, digitoxin, digitalinum verum, digitalein, digitin and digitophyllin. The acid resin was the least poisonous of these principles and produced the purest digitalis effect.

He prepared it in three ways:

(1) By extracting the powdered leaves with sulphuric ether. Maceration is allowed to proceed for about a week, drawing off the ethereal extract each day and adding fresh ether until the ethereal extract assumes a light green color. The ether is removed by spontaneous evaporation or by distillation. Percolation may also be used.

(2) It may be obtained by the evaporation of a fluid extract, adding purified animal charcoal until a soft mass results. This is subsequently dried in air, or at a temperature of 100°–110° F. After drying it is exhausted with ether in the usual manner.

(3) In a third method the powdered leaf is digested with a concentrated aqueous solution of sodium hydrate, allowed to stand for a day and filtered. It is then rendered acid with dilute sulphuric acid, which causes the acid resin to separate as a green precipitate.

By a further process sodium digitalate is made from the acid resin. Both digitalic acid and sodium digitalate are soluble in water and alcohol.

After many physiological experiments, Kolipinski concluded that the acid resin, "digitalic acid," possessed all the virtues, without any of the poisonous properties, of digitalis in medicinal or larger doses.

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Furthermore, it produced no cumulative effects nor irritation when used subcutaneously.

Sharp, 1914, however, discredits Kolipinski's results with digitalic acid and considers it an inactive product. Sharp prepared the digitalic acid, by digesting a quantity of powdered digitalis leaves for four days with 20 times its own weight of ethyl ether and then percolating with 100 times its weight of the same ether until no color was contained in the percolate. On evaporation of the ether, there remained a dark green resinous substance which readily dissolved in a cold solution of sodium hydrate. This was neutralized with a solution of sulphuric acid, and the product was then made up with 60 per cent alcohol, so that it would be equal in strength to the official tincture of digitalis of the British Pharmacopœia.

For comparative purposes the powdered leaves, which had been deprived of their digitalic acid, were next digested, percolated with 60 per cent alcohol and made up according to the official method for tinctures. These two tinctures were then tested on frogs to determine their physiological properties. The administration of the standard dose of the digitalic acid tincture produced no effect, the observation being carried on for 19 hours. The effect of the tincture made from the ether-treated leaves was to produce the usual digitalis effects, stopping the heart of the frog in four hours when using the usual standard dose. It was therefore as active physiologically as the standard tincture of digitalis and had lost none of its activity in removing the digitalic acid.

Smith, 1914, concurs in the view taken by Sharp, that digitalic acid has no effect whatever. Smith, using Allen's digitalis leaves, extracted the digitalic acid according to Kolipinski's method, and from the mass made a United States Pharmacopœial tincture of digitalis. The two preparations were then tested on frogs and guinea pigs; the conclusions reached were that digitalic acid was probably inert, and that the preparation made from the mass was equivalent in toxicity to that of good digitalis.

PHYSIOLOGICAL INVESTIGATIONS.

The literature bearing upon the physiological standardization of digitalis and its allies is very extensive, and since the appearance of Hygienic Laboratory Bulletins Nos. 48 and 74 relative to this subject, much has been written. The abstracts of the literature appearing in this paper are intended to cover the work not covered in the previous bulletins from this laboratory, and are only a partial survey of the field, being for the most part a consideration of only the most important papers.

Schmiedeberg, 1910, found that the relative activity of different lots of digitalis leaves could be determined with considerable accuracy

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by perfusing the heart of the frog (*Rana temporaria*) with the Williams apparatus, using a mixture of the digitalis preparations.

Previous to 1910, the Houghton 12-hour frog toxic method and the one-hour frog heart method were the only frog methods in use in this country. Pratt, 1910, examined a number of digitalis preparations by means of frogs, introducing a shorter time limit, determining the amount of infusion necessary to stop in systole the heart of the *Rana pipiens* at the end of 30 minutes. The method is essentially that of Gottlieb, 1908. Pratt found a variation of about 300 per cent in digitalis leaves.

Burmann, 1911, was unable to secure any parallelism between the results obtained by the chemical estimation of the digitoxin in digitalis preparations and the effect on the frog's heart when determined by the Focke method. He is convinced that the nature of the solvent plays an important rôle when using this method, and that the results obtained with it indicate only the comparative rate of absorption.

After considerable experience with frog methods for assaying digitalis, Sharp and Lancaster, 1911, adopted as a standard a tincture which would stop the heart and circulation of a male frog of 20 gm. weight in three hours, when 2.5 minims are injected into the dorsal lymph sac. The frogs are pithed and then set aside for 24 hours before using. In this way it was found that tincture of digitalis began to deteriorate between the thirteenth and fifteenth month. Leaves that were kept dry were active after 11 years.

The cat method of Hatcher and Brody, 1910, has been the subject of recent investigation. This method determines the amount of digitalis required to cause the death of a cat within 90 minutes, when the drug is slowly injected into the femoral vein. The standard chosen for the digitalis group is crystalline strophanthin, or ouabain.

Eckler, 1912, reports adversely upon the cat method of Hatcher and Brody. He considers that the cat method is the most difficult and complicated of all the American methods for standardizing drugs of the heart-tonic group, and that the results obtained are usually quite variable.

By physiological tests with frogs, Sharp and Branson, 1912, found that a tincture made from the petioles or leaf stalks had only half the toxicity of the leaves and petioles together, and that leaves gathered in November were as active as those gathered in August. Leaves collected from plants which had flowered and from plants which had not yet flowered were equally toxic. At the end of four months, preparations which were made in the laboratory that had a high alcoholic content (90 per cent) were not quite as toxic as those made from 60 per cent alcohol, although all were up to the standard. At the end of 20 months, of the 60 per cent tinctures, 7 out of 9 were

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potent; of the 90 per cent tinctures only 4 out of the 9 came up to the standard. It appeared, therefore, that if the 90 per cent alcohol did precipitate the enzyme, at the same time it decomposed the glucosides of the plant.

Heinz, 1912, believing that it is impossible to draw conclusions as to the value of a digitalis preparation from the effects upon the frog's heart alone, supplements the toxic frog and one-hour frog methods with toxic experiments on mice and by noting the effects on the blood pressure of rabbits and cats. When mice are used the procedure is as follows: After determining the minimum lethal subcutaneous dose of the digitalis preparation for these animals, a mouse is starved for a few hours and then given a food pill which contains an amount of the preparation equal to, or slightly larger than, the minimum lethal subcutaneous dose. An hour later a similar dose is given in the same way, and if this be not fatal, more pills are given until death ensues. The amount necessary to cause death is then noted, as well as the character of the symptoms produced by the preparation. As a standard, in either of the frog methods, g-strophanthin is used; in the mouse method the activity of the preparation under examination is compared with g-strophanthin and digitoxin.

In a very exhaustive paper, Weis, 1912, considers that by the Keller-Fromme digitoxin estimation method the digitoxin represents only about 2 per cent of the activity of digitalis leaves, and that the most commendable method for the physiological standardization of digitalis and its preparations is the one-hour frog method which is based upon the minimal amount per gram of frog weight that is necessary to produce systolic arrest of the heart. He emphasized the importance of using the same species of frog. The relative susceptibility of *Rana esculenta* and *R. temporaria* to a number of digitalis preparations varied, depending upon the digitalis preparation which was used. The true digitalin of Kiliani was fifty times as toxic for *R. temporaria* as for *R. esculenta*, whereas digitalein was only three times as toxic for the former as for the latter. For the examination of the activity of a large number of special preparations of digitalis he used *R. esculenta* exclusively. He found that these preparations of digitalis were especially variable in their activity. He concludes that a tincture made with absolute alcohol is the alcoholic preparation of digitalis which represents the full activity of digitalis leaves.

Cow, 1912, compared the special preparations digalen, digipuratum, and digitalone with a freshly made standardized tincture, by perfusion of the rabbit's heart through the coronaries, as well as by comparing their toxicity on frogs. He further secured data as to their comparative rate of absorption and their irritant properties,

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and concluded that not one of these new preparations was in any way superior to the tincture of digitalis.

During the years 1909 to 1911, inclusive, Goodall, 1912, examined 23 samples of tincture of digitalis which had been freshly made by reputable chemists. The standard employed was that 3 minims of the tincture should kill a male frog weighing 20 gm. within four hours. Of the 23 samples, 12 were of average potency, 6 were under the average, and 5 were over the average activity. In studying the effect of age upon the activity of tincture of digitalis, he concluded that digitalis probably retained its full activity for one year, but after that period loss in potency was likely to occur.

Using the cat method, Hatcher and Eggleston, 1913, investigated some of the factors which determine the keeping qualities of digitalis. They found that commercial digitalis leaves of good quality do not in many instances undergo deterioration as the result of age, and that, in á few cases, deterioration proceeds at a rate not to exceed a yearly loss in activity of 2 per cent. This was also true of United States Pharmacopœial preparations which contained at least 50 per cent of alcohol. Heat below 120° C., applied for a short time to digitalis leaves, did not decrease their activity.

Eggleston, 1913, compared the relative advantages of the cat method of Hatcher and Brody with the 1-hour frog method, the 12-hour frog method, and the guinea pig method of Reed and Vanderkleed, 1908, and decided that the cat method of Hatcher and Brody possessed the greatest number of advantages as an assay method for digitalis preparations.

According to Haskell, 1913, the alcohol in the galenical preparations of digitalis, unless removed before administration, reduces the toxicity of digitalis for guinea pigs and rabbits, whereas in the one-hour frog method alcohol to the amount of 25 per cent had no appreciable influence upon the results.

The method of Focke, 1903, as originally reported, determined the amount of a 10 per cent infusion of digitalis which would cause systolic arrest of the heart of *Rana temporaria*, of about 30 gm. weight, within the time limit of 7 to 25 minutes. The potency of the preparation was determined by dividing the weight of the frog (p) by the amount of infusion (d) injected into the leg lymph sac, multiplied by the time (t) required for systolic standstill to occur. The potency or value (V) of the preparation is therefore expressed by the formula $V=\frac{p}{d\times t}$ or $\frac{30}{0.6\times 10}=5$.

Good digitalis leaves, according to Focke, should have a value of 5.

From time to time slight changes have been suggested in his method. Recently Focke, 1914, suggested further modifications so as to meet certain criticisms which have been made against the method.

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Two new procedures are advocated—one makes use of medium doses, the other of minimal doses. In the medium dose method, he claims that it is possible to obtain approximate values only. The method holds good for leaves if their value be over 3.3. When leaves are below 3.3 in value, the minimal dose method should be employed. This method determines the smallest amount of the leaves per gram of frog weight which will produce the typical digitalis arrest. The minimal dose method, Focke claims, is more accurate than the former, but requires a longer time and the use of more animals. Injection should be made in ventral lymph sac, in the minimal dose method, since the heart is exposed only after an interval of half an hour or even longer.

To obviate the difference in the susceptibility of frogs at various seasons of the year, he employs a standardized preparation of digitalis leaves, and for its standardization he uses Kraft's water-soluble glucoside, gitalin. The action of gitalin upon the heart of *Rana temporaria* is similar to that of the infusion of digitalis, with the exception that relatively more of the infusion is required than of a solution of gitalin.

Holste, 1914, using the Schmiedeberg frog-heart method (Schmiedeberg, 1910) in a slightly modified form, determined the relative strength of a number of the active digitalis principles and some of the special preparations of digitalis. He considers that this method is capable of determining relative differences only, and that it is not suitable for the quantitative estimation of digitalis and its products.

The activity and stability of some British tinctures of digitalis were investigated by Symes, 1914, by means of the 12-hour frog method of Houghton. He found that while relatively few tinctures of digitalis were initially below the standard, those not below the standard varied in activity from 200 to 300 per cent. All such tinctures began to deteriorate after a variable length of time; some of them lost part of their activity within a month after their manufacture, and in the course of a year may have lost 70 per cent or more of their initial activity. He further found that "nonalcoholic tinctures" and allied preparations were not trustworthy.

The influence of atmospheric conditions upon the amount of active glucosides in digitalis was shown by Burmann, 1914, to be considerable. Temperature seemed to be the main factor in modifying the amount of glucosides formed. The higher the temperature, regardless of the amount of sunshine or rain, the greater was the yield of the glucosides produced.

Martindale, 1912, devised the following colorimetric method for determining whether a tincture met the requirements of the physiological test in which 0.75 cc. per 100 gm. of body weight of frog is taken as the minimum lethal dose. Ten cc. of the tincture of digi-

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talis are mixed with 10 cc. of water and then precipitated with a neutral lead acetate solution. The excess of lead is then removed from the filtrate, and after the addition of calcium carbonate, it is evaporated to dryness on a water bath. The residue is then extracted with chloroform. The chloroformic liquor is evaporated and the residue dissolved in 4 cc. of glacial acetic acid; 0.1 cc. of this acetic solution is mixed with 1 cc. of sulphuric ammonium molybdate reagent in a test tube and the color which develops after standing for five minutes is compared with a standard scale. In this way he determines whether a tincture is above, equal to, or below standard, so that the method estimates approximate activity only. Three hours are required to carry out the test. The most potent leaves which he examined were second year English leaves which had been grown in a sunny exposed situation.

In a study of the influence of heat and the method of storing upon the potency of home-grown *Digitalis gloxiniaeflora*, Haskell and Miller, 1914, concluded that a temperature of 120° C. applied to the green leaves caused no greater loss in toxicity than did a temperature of 40° C., when the toxicity was determined by the one-hour frog method. In the same manner they found that in one year, irrespective of the manner of storing, no change had occurred in the leaves, even where the moisture content was as great as 6.04 per cent.

Attention was called to the need for more accurate botanical investigations, preceding the comparative estimations of the digitalis group of drugs, by Miller and Baker, 1914. By the one-hour frog method an examination was made of 31 samples of home-grown digitalis, representing many species and varieties which were grown under uniform conditions and from seed of known source. The varieties which had originated from the species purpurea showed a variation in activity of over 75 per cent. The highest toxicity was obtained from the species lanata. Eighty-three per cent of the total number of samples were more active than the official *Digitalis purpurea*. They found that cultivation in itself did not lessen the toxicity of digitalis.

Kobert, 1914, estimated the haemolytic activity of a number of tinctures of digitalis and found that their haemolytic properties varied according to the method of preparation. There was no active haemolytic saponin in the infusion nor in a tincture made from green leaves with 96 per cent alcohol. An examination of five tinctures showed that the dilutions required to hæmolyze human blood varied from 1 in 250 to 1 in 2,000. He also determined the physiological activity of a number of tinctures of digitalis by ascertaining the minimum amount that would produce death of the frog (*Rana esculenta*) within 24 hours when injected into a leg or back lymph sac.

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Tinctures made from recent leaves with 96 per cent alcohol were more active than the strongest official preparations, and when made according to Kobert's method showed less deterioration than official tinctures. A variation of over 200 per cent was found in the official tinctures by the 24-hour toxic frog method.

Rapp, 1914, investigated the advisability of using a chemical method for determining the toxicity of digitalis and arrived at the conclusion that the amount of digitalis principles in digitalis leaves could not be quantitatively determined in that way; however, by means of the one-hour frog method according to the directions of Hale, he was able to secure quite accurate quantitative results. He preferred this biological method to that of Focke, since he was able to secure very constant results with it, whereas with the Focke method very wide differences were obtained, even though every precaution was taken to control the temperature factor. Rapp further showed by the frog method that the active principles in digitalis leaves slowly deteriorate through enzyme action and that by heating digitalis in the autoclave at 105° C. for 10 minutes an enzyme-free digitalis could be obtained which preserved its activity even in the moist state. The amount of sugar obtained from a sample of digitalis by the action of ferments gave no satisfactory indication as to its toxicity.

The use of goldfish (*Carassius auratus*) as test animals for determining the activity of digitalis has recently been suggested by Pittenger and Vanderkleed, 1915. This is one of the most simple methods that has been recommended, as it is necessary only to determine the dilution of the drug in tap water which will cause the death of the animal in a given time. These authors found that a 1 to 1,000 dilution of the fluid extract of digitalis would cause the death of a goldfish in a little over an hour. These animals were found to be sensitive to variations of 2½ per cent in the dilutions of digitalis used; decreasing the strength of the dilution increased the sensitiveness of the test. The weight of the fish could be disregarded, but variation in temperature influenced results markedly. No marked individual variation in their susceptibility was found, such as occurs in frogs and guinea pigs, and differences in the rate of absorption appeared to be practically eliminated by the use of goldfish.

THE RESULTS OF THE PRESENT INVESTIGATION.

The purpose of the present investigation has been primarily to ascertain the activity of a number of commercial preparations of fat-free digitalis and German digitalin.

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CONSIDERATION OF THE ONE-HOUR FROG METHOD.

It is generally conceded that biological methods are more reliable than chemical methods for determining the activity of digitalis, consequently a biological method was employed for their examination. The one-hour frog method was selected, inasmuch as it was provisionally adopted by the Hygienic Laboratory for determining the strength of digitalis and its allies (Hale, 1911). The work of Hale, referred to above, has shown the adequacy of this method for the examination of these preparations. Briefly stated, the test aims to determine the quantity of digitalis which will produce permanent systole of the ventricle, after one hour, when injected into the ventral lymph sac. The details of the method for the present work are essentially those which Hale employed, with the exception that a temperature of 20° C. was used for making the assays. Before their injection into the frogs all tinctures were evaporated over a water bath to remove the alcohol and then made up so as to have an alcoholic content of 25 per cent. The aqueous preparations containing chloretone as a preservative were injected as such. As a solvent for the German digitalin 25 per cent alcohol was used.

The success which the one-hour frog method of assay has met with in this country is no doubt partly due to the fact that the various factors which must be considered when an assay is made upon frogs are kept uniform. Before taking up the main purpose of this paper an investigation of some of these factors will be made.

The species *Rana pipiens* should be selected. The animals should be healthy, preferably of about 20 to 30 gm. in weight, and when in captivity should be kept in tanks containing running water and in a comparatively cool place at 12°–15° C. When used for an assay they should be brought into the laboratory, which is usually kept at 20° C., at least several hours before the experiment.

Effect of temperature upon the toxicity of digitalin and digitoxin.—A very disturbing factor in the one-hour frog method is that of absorption. The variability of the concentration of the fluid injected may also be responsible for differences in reaction, if the dilution vary within wide limits. Temperature has also been shown by a number of workers to be a factor in the toxicity of digitalis and its allies in frogs. Hale, 1911, found that absorption in frogs was variable, but was at a loss to know what conditions modified absorption. However, he was partly convinced that unhealthy frogs showed poor absorption. He found that if the animals were kept at a temperature of 10° to 15° C., not only would the general health be better, but the absorption would be more nearly complete. Baker, 1912, using *Rana pipiens* in the one-hour method, determined the effect of temperature upon the toxicity of ouabain, tincture of strophanthus,

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and tincture of digitalis, and not only found that the resistance of the frogs decreased as the temperature was increased, but demonstrated variation in the susceptibility of different lots of frogs.

Of two lots of frogs in Baker's series, the variability in reaction was greater than 100 per cent to both ouabain and tincture of strophanthus. The toxicity of ouabain, tincture of strophanthus, and tincture of digitalis at various temperatures in one lot of frogs, obtained apparently from a local source of supply and which weighed from 15 to 20 gm., was as follows:

TABLE 1 (BAKER'S SERIES).—*Toxicity of ouabain, tincture of strophanthus, and tincture of digitalis.*

Temperature.	Ouabain, 1 to 10,000.	Tincture of strophanthus, 10 per cent.	Tincture of digitalis, 10 per cent.
10° C.	0.000,000,80	0.000,080	0.004
20° C.	0.000,000,45	0.000,040	0.004
30° C.	0.000,000,20	0.000,020	0.003

In another lot of frogs obtained from Minnesota, which averaged about 50 gm. in weight, he obtained the following results:

TABLE 2 (BAKER'S SERIES).

Temperature.	Ouabain, 1 to 10,000.	Tincture of strophanthus, 10 per cent.	Tincture of digitalis, 10 per cent.
10° C.	0.000,001,0	0.000,17	0.006
20° C.	0.000,000,8	0.000,09	0.004
30° C.	0.000,000,3	0.000,04	0.003

While the variation in toxicity at these temperatures is nearly parallel for ouabain and strophanthus, no such parallelism exists for digitalis. From these results he concludes that, while ouabain or strophanthus preparations may be used as standards in strophanthus standardization, they can not be used as standards for digitalis and its preparations. In Table 1 it is shown that the susceptibility to ouabain and strophanthus increases fourfold when the temperature is increased from 10° to 30° C., while for digitalis the increase in toxicity when the temperature is raised from 10° to 30° C. is only about 25 per cent. In these experiments no attempt was made to ascertain difference in susceptibility due to sex.

The influence of temperature upon the reaction of the heart of the intact frog to ouabain was also studied by Sollmann, Mendenhall, and Stingel, 1915, employing the grass frog in the one-hour frog method. Their results confirmed those of Baker. Weis, 1912, also studied the effect of temperature variation upon the toxicity of

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tincture of digitalis for *Rana esculenta* by the one-hour frog method, and found no variation in toxicity between 14° and 22° C., while at the temperature of 10° C. digitalis was less toxic than at 14° C.

In order to ascertain whether digitalin, German, which is a mixture of glucosides, but consists largely of true digitalin and digitonin, might vary in toxicity with changing temperature in a similar way to ouabain and strophanthus, I carried out the following set of experiments:

Frogs (*Rana pipiens*) varying in weight from about 35 to 45 gm. were used, being injected in the anterior lymph sac with digitalin, German (Mallinckrodt), in a 25 per cent solution of alcohol.

TABLE 3.—*Males.*

TOXICITY OF DIGITALIN, GERMAN (MALLINCKRODT), BY THE 1-HOUR FROG METHOD.

A. TEMPERATURE 10° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,06	Beats.
0.000,02	Do.	0.000,07	Do.
0.000,03	Do.	0.000,08	Stopped.
0.000,04	Do.	0.000,09	Do.
0.000,05	Do.	0.000,10	Do.

Toxicity=0.000,08 per gram of body weight.

B. TEMPERATURE 20° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,04	Stopped.
0.000,02	Do.	0.000,05	Do.
0.000,03	Do.	0.000,06	Do.

Toxicity=0.000,04 per gram of body weight.

C. TEMPERATURE 30° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,03	Stopped.
0.000,02	Do.	0.000,04	Do.

Toxicity=0.000,03 per gram of body weight.

These results, in a way, are similar to those of Baker with digitalis, the toxicity increasing with the increase in temperature, but not to so marked a degree as he obtained with ouabain or strophanthus.

Relation of temperature to absorption.—The absorption, however, varied inversely with the toxicity; at 30° and 20° C. the absorption was better than at 10° C. At the low temperature of 10° a little over 50 per cent of the frogs showed marked retention of fluid in the lymph sac, whereas at 20° or 30° less than 20 per cent showed only a moderate retention of fluid in the injected lymph sac.

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When females were used the results were similar, as tabulated below:

TABLE 4.—*Females.*

TOXICITY OF DIGITALIN, GERMAN (MALLINCKRODT), BY THE 1-HOUR FROG METHOD.

A. TEMPERATURE 10° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,02	Beats.	0.000,05	Beats.
0.000,03	Do.	0.000,06	Do.
0.000,04	Do.		

(Unfortunately no more female frogs were obtainable in this lot, so the experiment could not be completed. It will suffice to show, however, that the toxicity was notably lessened, as was the case with males.)

B. TEMPERATURE 20° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,04	Stopped.
0.000,02	Do.	0.000,05	Do.
0.000,03	Do.		

Toxicity=0.000,04 per gram of body weight.

C. TEMPERATURE 30° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,03	Stopped.
0.000,02	Do.	0.000,04	Do.

Toxicity=0.000,03 per gram of body weight.

These experiments show that the sex of the animals may be disregarded in the one-hour frog method—females showed a more variable absorption than did males as the only noticeable difference. The occurrence of eggs bore no relation to the degree of absorption.

The reaction of frogs to digitoxin (Merck) was likewise determined for the temperatures of 10°, 20°, and 30° C. A solution of digitoxin was made up in absolute alcohol on the day of the experiment, and immediately before the experiment was begun a further dilution was made with distilled water, so that the solvent consisted of 25 per cent of alcohol. Injections were then made as rapidly as possible before cloudiness appeared in the solution. The results are indicated in the following table:

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TABLE 5.—*Toxicity of digitoxin (Merck) by the one-hour frog method—male frogs alone were used.*

A. TEMPERATURE 10° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,006	Beats.	0.000,011	Beats.
0.000,007	Do.	0.000,012	Do.
0.000,008	Do.	0.000,013	Stopped.
0.000,009	Do.	0.000,014	Do.
0.000,010	Do.		

Toxicity=0.000,013 per gram of body weight.

B. TEMPERATURE 20° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,003	Beats.	0.000,008	Beats.
0.000,004	Do.	0.000,009	Stopped.
0.000,005	Do.	0.000,010	Do.
0.000,006	Do.	0.000,011	Do.
0.000,007	Do.		

Toxicity=0.000,009 per gram of body weight.

C. TEMPERATURE 30° C.

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,003	Beats.	0.000,007	Beats.
0.000,004	Do.	0.000,008	Stopped.
0.000,005	Do.	0.000,009	Do.
0.000,006	Do.	0.000,010	Do.

Toxicity=0.000,008 per gram of body weight.

These experiments show that temperature influences the reaction of the frog to digitoxin in a similar way to what was shown for digitalin, the difference being one of degree. It was also found that the absorption of the injected fluid varied inversely with the toxicity.

Effect of alcohol and concentration of injection fluid upon toxicity.—Considerable emphasis is usually placed on the concentration of the fluid injected into the lymph sac. In Hale's work (Hale, 1911) an amount equal to 0.015 cc. per gram of body weight was used. It is usually customary to use this amount, which in actual practice would vary between about 0.25 and 1 cc. In examining the various digitalis glucosides, it is also the practice to use as a solvent 25 per cent alcohol.

The use of alcohol as a solvent may possibly be considered by some to be a disturbing factor, either to increase or decrease the toxicity of the digitalis bodies. To determine this point a set of experiments was performed, using Mallinckrodt's digitalin, German, injecting it in quantities varying from 0.5 to 1 cc. The doses were calculated per gram of body weight and, if the concentration employed was such that 0.25 cc. would be the amount necessary to inject, the

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amount actually injected, 0.5 cc., was made up by adding 25 per cent alcohol. The concentration of the solution, therefore, varied with the weight of the animal, so these experiments show the effects of varying the concentration of the injection fluid, as well as the effect of the alcohol. The experiments were all performed at 20° C., the injection being made into the ventral lymph sac.

Toxicity of digitalin, German (Mallinckrodt), by the one-hour frog method, using 0.5 cc. as the total amount of 25 per cent alcohol as the solvent for injection into the ventral lymph sac:

TABLE 6.—*Males—Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,04	Stopped.
0.000,02	Do.	0.000,05	Do.
0.000,03	Do.	0.000,06	Do.

Toxicity=0.000,04 per gram of body weight.

Toxicity of digitalin, German (Mallinckrodt), by the one-hour frog method, using 1 cc. as the total amount of 25 per cent alcohol as the solvent for injection into the ventral lymph sac:

TABLE 7.—*Males—Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,02	Beats.	0.000,05	Stopped.
0.000,03	Do.	0.000,06	Do.
0.000,04	Do.		

Toxicity=0.000,05 per gram of body weight.

The absorption was deficient in most of the experiments in Table 7 of this series. It may be concluded, therefore, that the absorption is more regularly complete when about 0.5 cc. rather than larger amounts of the fluid are used, and that the toxicity is decreased slightly when an amount of alcoholic solvent as large as 1 cc. is used. The conclusion of Haskell, 1913, therefore, that 25 per cent alcohol had no influence on the toxicity of digitalis in the one-hour frog method, is not fully concurred in.

To ascertain whether the toxicity differs, depending upon whether the ventral or the leg lymph sac is used, the following set of experiments was carried out.

Toxicity of digitalin, German (Mallinckrodt), by the one-hour frog method, using 0.5 cc. as the total amount of 25 per cent alcohol as the solvent for injection into the leg lymph sac:

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TABLE 8.—*Males—Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,05	Stopped.
0.000,02	Do.	0.000,06	Do.
0.000,03	Do.	0.000,07	Do.
0.000,04	Stopped.		

Toxicity—0.000,04 per gram of body weight.

The absorption was about the same in this series as in the series in Table 6.

Either the leg or ventral lymph sac, therefore, can be used for digitalin when the fluid injected measures about 0.5 cc. If the amount of fluid injected measures 0.5 cc., there is no difference in toxicity when either an alcoholic or aqueous solvent is employed, if the injections be made into the ventral lymph sac. This is illustrated in the following series.

Toxicity of digitalin, German (Mallinckrodt), by the one-hour frog method, using 0.5 cc. as the total amount of an aqueous solution injected into the ventral lymph sac:

TABLE 9.—*Males—Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.000,01	Beats.	0.000,04	Stopped.
0.000,02	Do.	0.000,05	Do.
0.000,03	Do.	0.000,06	Do.

Toxicity—0.000,04 per gram of body weight.

It is shown by this series that the toxicity of digitalin, German (Mallinckrodt), is the same, regardless of whether the solvent is alcohol or water. The absorption, however, was less complete in this series than in the series in Table 6. This would necessitate using more animals in an assay, in order to insure accuracy of results.

FAT-FREE DIGITALIS.

Types of preparations.—The fat contained in digitalis leaves, and other alcoholic preparations made from it, is considered by many to be an especially deleterious ingredient. The well-known toxic symptoms of digitalis—nausea and vomiting—are often attributed to the fat contained in digitalis, and to avoid this, especially in selected cases, many have resorted to fat-free preparations. They are also intended for hypodermatic use, to avoid irritating effects. The fat-free preparation which is usually administered is made up as an alcoholic tincture. However, there are also preparations free from fat which are dispensed in a nonalcoholic solvent and which, presumably, contain only

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the water-soluble constituents. The fat-free digitalis now on the market is made up in three ways:

(1) The drug is exhausted with petroleum benzine and made up in the usual way (La Pierre, 1910). An illustration of this class is found in "Digitol," [1] made by Mulford & Co. It is said to be digitalis which has previously been subjected to percolation with petroleum benzine and afterwards extracted by percolation with the hydro-alcoholic menstruum according to the pharmacopœial method for making tinctures.

(2) The England, 1899, process may be used. This removes the fat from the leaves by means of petroleum benzine, much the same as in method (1), but later neutralizes the acids present in the preparation with several cubic centimeters of official ammonia water. This method is designed not only to remove the fixed oil that is present in the leaves, but to prevent the supposed irritating effects of the free acids, to which the author attributes some of the unpleasant physiological effects of digitalis. The method in detail is as follows:

Fat-free tincture of digitalis was made by exhausting the leaves, while freshly ground (to a No. 60 powder), with petroleum benzine, either by maceration with solvent in excess for 48 hours, if in small quantity, or by maceration and subsequent percolation, if in larger quantity, repeating the solvent treatment until all the fat, etc., is removed. The residue is then dried by exposure to air, taking care that no traces of benzine odor remain. Exposure of the residue to the sunlight, as well as to the open air, yields the best results. After the benzine treatment, the dried and powdered leaves are made into a tincture according to the process for the official product, 150 grams of leaves being used to make 1,000 cc. with diluted alcohol, with this difference, that the receiver is removed when the total percolate amounts to about 980 cc. and it is then carefully neutralized with a sufficient quantity (about 10 or 15 cc.) of the official 10 per cent ammonia water, and the product is made to measure 1,000 cc. with sufficient fresh percolate or diluted alcohol. Or, with the usual weights and measures, 1,094 grams of the powdered leaves may be exhausted with diluted alcohol to yield 15½ fluid ounces, and then about 1 or 2 fluidrachms of 10 per cent ammonia water will be required to effect neutralization, after which sufficient percolate or diluted alcohol should be added to make the whole product measure 1 pint. After standing for 24 hours the freshly made tincture usually precipitates some coloring matters, etc., which should be removed by filtration through paper.

The fat-free tincture thus obtained is distinctly different from the tincture made according to method (1) in that it is neutral in reaction, while pharmacopœial tinctures or those made by the previous method are acid in reaction. According to England, the neutralization with ammonia makes all the principles in the tincture water-soluble. By this means he claims that absorption is facilitated and assimilation is hastened. It will be noticed that the method given above plans to produce a product approaching in activity that of the United States Pharmacopœial tincture of the seventh revision. Whether any changes in the method have been made since then is not known.

[1] New and Nonofficial Remedies, 1915, p. 106.

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(3) The third type of fat-free tinctures is a nonalcoholic solution of digitalis principles. This type is illustrated by "Digitalone," which is manufactured by Parke, Davis & Co. The details of the method of manufacture are not known, but according to the makers it is said to be a nonalcoholic solution of digitalis which is "absolutely fat-free." As a means of keeping the preparation from deteriorating on account of age, etc., chloretone is used as a preservative.

It is seen, therefore, that the term "fat-free digitalis" is an expression that is loosely defined, and the product may be either an alcoholic or a nonalcoholic solution of all or part of the active glucosides of digitalis. The greater number of fat-free digitalis preparations fall under the first or second class, the only member of the third class dealt with in this work being "Digitalone."

Preparations assayed.—Perhaps the most essential point to be determined about the fat-free digitalis preparations which are on the market is their activity. To determine their strength comparatively, 13 samples were obtained upon the open market by the laboratory pharmacist. Their activity was then determined by the one-hour frog method in the manner previously described. The following samples were examined:

TABLE 10.—*Samples examined.*

Sample No.	Trade name or other assigned title.	Name of manufacturer.
1	Tincture Digitalis (fat-free)	John Wyeth & Bro.
2	Digitaligen (fat-free digitalis)	G. D. Searle & Co.
3	Tincture Digitalis Purified (fat-free)	Sharp & Dohme.
4	Tincture Digitalis (fat-free)	Smith, Kline & French Co.
5	Tincture Digitalis (fat-free)	Nelson, Baker & Co.
6	Tincture Digitalis (fat-free)	E. R. Squibb & Co.
7	Tincture Fat-Free Digitalis	E. L. Patch Co.
8	Tincture Digitalis (fat-free)	Pitman-Myers Co.
9	Digitol (fat-free tincture digitalis)	H. K. Mulford Co.
10	Tincture Digitalis (fat-free)	Parke, Davis & Co.
11	Tincture Digitalis (fat-free)	Eli Lilly & Co.
12	Digitalone A	Parke, Davis & Co.
13	Digitalone B	Do.

Results of assays.—The result of the assays of the above preparations by the one-hour frog method will be given below, together with the information, supplied by the manufacturers, that appeared on the labels of the containers. The drug was injected into the ventral lymph sac in all cases.

Sample 1.

Name of preparation, Tincture of Digitalis (fat-free).
Name of maker, John Wyeth & Bro., Philadelphia, Pa.
Serial number, 1091427.

This preparation corresponds in strength to the official tincture and is practically free from all fixed oil and other irritating principles that are prone to produce nausea and other gastric disturbances. It is especially designed for hypodermatic use, and can be administered in this manner with but little danger of the formation of abscesses.

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TABLE 11.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.004	Beats.	0.01	Beats.
0.005	Do.	0.011	Do.
0.006	Do.	0.012	Do.
0.008	Do.	0.013	Stopped.
0.009	Do.	0.015	Do.

Toxicity=0.013 per gram of body weight.

Sample 2.

Name of preparation, Digitaligen (fat-free digitalis).
Name of manufacturer, G. D. Searle & Co., Chicago, Ill.
Serial number, 97–17.

This preparation is made from the best obtainable German, second year, digitalis leaves, and is 50 per cent stronger than the tincture digitalis U. S. P. VIII. It is used as a cardiac tonic and diuretic. It is deprived of free acids and fats and has a neutral reaction; is nonaccumulative, nonirritating, and does not cause abscesses when used hypodermatically. It can be diluted to any extent without precipitation. In overdoses it is poisonous.

TABLE 12.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.004	Beats.	0.012	Stopped.
0.008	Do.	0.014	Do.
0.009	Do.	0.015	Do.
0.011	Do.		

Toxicity=0.012 per gram of body weight.

Sample 3.

Name of preparation, Tincture Digitalis Purified (fat-free).
Name of manufacturer, Sharpe & Dohme, Baltimore, Md.
Serial number, 2808–20406.

Strength of tincture digitalis, U. S. P.

TABLE 13.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.005	Beats.	0.009	Beats.
0.006	Do.	0.010	Stopped.
0.007	Do.	0.012	Do.
0.008	Do.	0.015	Do.

Toxicity=0.01 per gram of body weight.

Sample 4.

Name of preparation, Tincture of Digitalis (fat-free).
Name of manufacturer, Smith, Kline & French Co., Philadelphia, Pa.
Serial number, 414167.

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Tested physiologically and found to be of full strength on August 1, 1913.

TABLE 14.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.006	Beats.	0.010	Stopped.
0.007	Do.	0.011	Do.
0.008	Do.	0.012	Do.
0.009	Stopped.		

Toxicity=0.009 per gram of body weight.

Sample 5.

Name of preparation, Tincture Digitalis (fat-free).
Name of manufacturer, Nelson, Baker & Co., Detroit, Mich.
Serial number, 112674.

Clinical experience has shown that a fat-free tincture of digitalis produces its effects more promptly and with greater uniformity than the official preparation. Since digitalis is a drug very liable to vary in strength, uniformity of action in its galenical preparations can only be secured by standardizing them by physiological assay, and this preparation is so standardized.

TABLE 15.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.004	Beats.	0.012	Stopped.
0.007	Do.	0.015	Do.
0.008	Do.	0.02	Do.
0.009	Stopped.		

Toxicity=0.009 per gram of body weight.

Sample 6.

Name of preparation, Tincture of Digitalis (fat-free).
Name of manufacturer, E. R. Squibb & Sons, New York City.
Serial number, 243118.

Prepared according to the J. W. England's process, by which the oil present in the drug is removed; 10 cc. represent 1 gm. of drug.

TABLE 16.—*Temperature, 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.007	Beats.	0.01	Stopped.
0.008	Do.	0.014	Do.
0.0085	Do.	0.016	Do.
0.009	Stopped.		

Toxicity=0.009 per gram of body weight.

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Sample 7.

Name of preparation, Tincture of Fat-free Digitalis.
Name of manufacturer, E. L. Patch Co., Boston, Mass.
Serial number, 413300T.

TABLE 17.—*Temperature, 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.005	Beats.	0.008	Stopped.
0.006	Do.	0.009	Do.
0.007	Do.	0.015	Do.

Toxicity—0.008 per gram of body weight.

Sample 8.

Name of preparation, Tincture Digitalis (fat-free).
Name of manufacturer, Pitman-Myers Co., Indianapolis, Ind.
Serial number, SFS7.14.51234.

One fluid ounce is equal to 45½ grains of selected digitalis leaves deprived of acids and fats. Date of manufacture, July 17, 1914. Cardiac tonic, diuretic. This tincture produces effects in about three-fifths of the time required by tincture digitalis U.S.P. It causes no gastric disturbance. It is nonirritating and can be used hypodermatically.

TABLE 18.—*Temperature, 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.003	Beats.	0.008	Stopped.
0.004	Do.	0.009	Do.
0.005	Do.	0.01	Do.
0.006	Do.	0.13	Do.
0.007	Do.	0.16	Do.

Toxicity—0.008 per gram body weight.

Sample 9.

Name of preparation, Digitol.
Name of manufacturer, H. K. Mulford Co., Philadelphia, Pa.
Serial number, 56209B.

Cardiac tonic and diuretic. This tincture of fat-free digitalis is free from the fixed and volatile oils present in the United States Pharmacopœial tincture, and therefore mixes clear with water. It is of the same strength as official tincture and is employed in the same doses. Physiologically and chemically standardized. This preparation was physiologically tested and standardized May 4, 1914.

TABLE 19.—*Temperature, 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.003	Beats.	0.007	Stopped.
0.004	Do.	0.008	Do.
0.005	Do.	0.012	Do.
0.006	Do.		

Toxicity—0.007 per gram of body weight.

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Sample 10.

Name of preparation, Tincture Digitalis (fat-free).
Name of manufacturer, Parke, Davis & Co., Detroit, Mich.
Serial No., 1835960.

Manufactured May 21, 1914. Standardized by physiological assay. Ten cc. of this tincture is equivalent to 1 gm. of digitalis leaves of average strength. The drug is thoroughly extracted with a suitable solvent to remove the fat and certain irritating substances. Contains 6 heart tonic units per cubic centimeter.

TABLE 20.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.003	Beats.	0.007	Stopped.
0.004	Do.	0.008	Do.
0.005	Do.	0.009	Do.
0.006	Stopped.		

Toxicity—0.006 per gram of body weight.

Sample 11.

Name of preparation, Tincture Digitalis (fat-free).
Name of manufacturer, Eli Lilly & Co., Indianapolis, Ind.
Serial No., 121687–509410.

Physiologically tested and adjusted so as to equal tincture digitalis U. S. P. in effect.

TABLE 21.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.003	Beats.	0.007	Stopped.
0.004	Do.	0.008	Do.
0.005	Stopped.	0.009	Do.
0.006	Do.		

Toxicity—0.005 per gram of body weight.

Sample 12.

Name of preparation, Digitalone (A).
Name of manufacturer, Parke, Davis & Co., Detroit, Mich.
Serial No., 025580C.

Each fluid ounce contains chloretone, 2½ grains. An aseptic, nonalcoholic, non-irritating solution of digitalis. Activity equal to one-tenth strength of fluid extract of digitalis U. S. P. Can be administered either hypodermatically or internally. Manufactured September 24, 1914. Physiologically assayed. Contains 6 H. T. U. (heart tonic units) per cubic centimeter.

TABLE 22.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.002	Beats.	0.006	Stopped.
0.003	Do.	0.007	Do.
0.004	Do.	0.008	Do.
0.005	Stopped.		

Toxicity—0.005 per gram of body weight.

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Sample 13.[1]

Name of preparation, Digitalone (B).
Name of manufacturer, Parke, Davis & Co., Detroit, Mich.
Serial No., 08776.

An aseptic, nonalcoholic, nonirritating, permanent solution of digitalis. Activity equal to one-tenth strength of fluid extract of digitalis U. S. P. Can be administered either hypodermatically or internally.

TABLE 23.—*Temperature 20° C.*

Amount per gram of body weight.	Result.	Amount per gram of body weight.	Result.
0.02	Beats.	0.06	Beats.
0.03	Do.	0.07	Stopped.
0.04	Do.	0.08	Do.
0.05	Do.	0.09	Do.

Toxicity=0.07 per gram of body weight.

TABLE 24.—*Fat-free digitalis preparations mentioned above, arranged in respect to toxicity.*

Sample.	Toxicity.	Sample.	Toxicity.	Sample.	Toxicity.
12	0.005	7	0.008	2	0.012
11	0.005	6	0.009	1	0.013
10	0.006	5	0.009	13	0.07
9	0.007	4	0.009		
8	0.008	3	0.010		

With the exception of samples 12 and 13, all of these preparations were bought during the months of August, September, and October, 1914; sample 12 was purchased in November, and sample 13 several years ago. All of the samples, except sample 13, were examined only a week or two after their purchase, and were kept while in the laboratory in a cool, dark place; so the deterioration, due to keeping, which may have occurred between the date of their purchase and examination may be said to be nil.

Of the 12 samples purchased during the closing months of last year, a variation in toxicity of over 200 per cent is shown to exist. This variation bears no relation to any discernible factor, such as reaction to litmus or alcoholic content, as will be shown by the following table:

TABLE 25.

Sample.	Reaction to litmus.	Alcoholic content in per cent.	Sample.	Reaction to litmus.	Alcoholic content in per cent.
1	Acid	45	8	Neutral	44
2	Neutral	50	9	Acid	70
3	Acid	45	10	Do	75
4	Neutral	43	11	Do	45
5	Acid	50	12	Do	(2)
6	Neutral	43	13	Do	(2)
7	Acid	47			

[1] This preparation had been in the laboratory for at least several years, the seal of the container had been broken and part of the contents removed. The bottle had been securely corked, however, and was kept in its original cardboard package.
[2] Nonalcoholic.

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Deterioration of samples examined.—Nine of these preparations were again examined by the same method, after from five to seven months, to ascertain whether any deterioration had occurred. It was found that, even after five months, deterioration had begun in most of them. Only two samples retained their original activity. The degree of deterioration bore no constant relation to the reaction of the preparation to litmus. One of the preparations which showed no loss of activity was an acid tincture (Parke, Davis & Co., No. 10), which possessed the high alcoholic content of 75 per cent, while the other was an acid preparation containing 50 per cent alcohol. Apparently the amount of alcohol contained in the solvent is in itself no safeguard against the deterioration of fat-free tincture of digitalis, since a marked decrease in potency was found in one sample (Mulford, No. 9), in which 70 per cent alcohol was used as a solvent.

Since it is usually considered that the potency of fat-containing tincture of digitalis is unaltered for a period of about a year, when 70 per cent alcohol is used as a solvent, the finding of deterioration in the fat-free tincture (Mulford, sample No. 9) is indeed noteworthy.

For purposes of comparison, the following table, showing the keeping qualities of the preparations examined, is appended:

TABLE 26.

Preparation No.	Name of maker.	Activity at first examination.	Activity at second examination.	Months elapsing between first and second examinations.
3	Sharpe & Dohme	0.010	0.011	5
4	Smith, Kline & French Co	.009	.01	6
5	Nelson, Baker & Co	.009	.009	6
6	E. R. Squibb & Sons	.009	.01	6
7	E. L. Patch Co	.008	.009	6
8	Pitman, Myers & Co	.008	.01	6
9	H. K. Mulford Co	.007	.01	6
10	Parke, Davis & Co	.006	.006	7
12	.....do	.005	.009	5

Effect of fat-free tincture of digitalis on the heart and blood pressure of the dog.—In order to determine whether any qualitative differences might exist between a neutral and an acid preparation of fat-free digitalis, a comparison was made on dogs, using the Squibb and the Nelson, Baker & Co. preparations.

These tinctures, as has been previously shown, assayed absolutely alike by the one-hour frog heart method. They were compared by noting the effects which they caused on the heart and blood pressure of the dog. The dogs were anaesthetized with chlorbutanol, 0.35 gm. per kilo, administered per stomach. The blood pressure readings were taken from the carotid artery in the usual manner, while the heart tracings were obtained by attaching separately, a portion of

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both auricle and ventricle to separate heart levers of the Cushny type. The phrenics were cut, to avoid diaphragmatic movements which might interfere with the contractions of the heart. All the injections were made into the femoral vein, the drug having previously been deprived of its alcohol and made up to its original amount with physiological salt solution.

The effect of either the Squibb or Nelson-Baker preparation was such as to produce a gradual and prolonged rise in the blood pressure, together with a distinct increase in the tonus of the heart when given in 2 cc. doses at the beginning of an experiment, before toxic symptoms had appeared. For example, a 2 cc. dose of Squibb's preparation in one animal produced a rise in blood pressure of 20 millimeters of mercury; whereas a 2 cc. dose of the Nelson, Baker & Co. preparation, given 12 minutes later, caused a rise of 41 millimeters. This was followed in 20 minutes by a similar amount of the Squibb preparation, causing a rise in the blood pressure of 30 millimeters. A distinct increase in the tonus of the heart occurred after the first and second injections; while after the third injection a slight increase in the tonus occurred, which was followed by a slight decrease in tonus. Heart irregularities followed later so that the experiment had to be discontinued.

Comparison of effect of fat-free digitalis with official tincture of digitalis.—Comparisons were made in the same way between United States Pharmacopoeial tincture and the Squibb preparations, also between the E. L. Patch and the Pitman-Myers preparations. No qualitative differences in their effects on the blood pressure and heart of dogs were found. We may conclude, therefore, that there is no marked qualitative difference between neutral and acid fat-free tinctures of digitalis, nor between fat-free tincture of digitalis and the pharmacopoeial tincture of digitalis, which is not fat-free. The method of extraction would appear to be unimportant except insofar as it may influence deterioration. That deterioration may occur is suggested by the results of the assays. No experiments were made with Digitalone in this way.

Absorption of fat-free digitalis from the lymph system of the frog.—As mentioned previously, England considers that neutral fat-free digitalis is more readily absorbed than is the acid fat containing preparation. Experimentally, however, the absorption of a neutral fat-free tincture from the lymph system in the frog is no faster than is that of an acid pharmacopœial tincture. By the use of frogs this was shown in the following manner: The brain of the frog was destroyed by pithing, after which the pithed animal was securely tied to a frog board and a window cut through the pectoral girdle so as to expose the heart. By means of a wire clamp and string, the tip

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of the ventricle was connected to a light heart lever for recording the cardiac movements. After a kymographic record was made of the normal cardiac movements, the drug was injected into one of the lymph sacs and the cardiac effects similarly recorded. The time when marked irregularities occurred was noted. The following table of experiments is illustrative of the comparative absorbability of a neutral fat-free tincture and an acid fat containing pharmacopœial tincture. The toxicity of these preparations was the same, 0.010 cc. per gram of body weight.

TABLE 27.—*Comparison of the effects of a United States Pharmacopœial tincture of digitalis, with a neutral fat-free tincture of digitalis on the intact frog's heart.*

Preparation.	Average weight of frog, in grams.	Dose per gram, body weight.	Average time, in minutes, between injection of drug and appearance of cardiac irregularities.
U. S. P. tincture	36	0.02	17
Sample No. 3 (Sharpe & Dohme)	41	.02	21

The length of time elapsing before marked cardiac irregularities appeared was somewhat longer for the neutral tincture (sample No. 3) than for the acid pharmacopœial tincture. The differences are so slight that it may be concluded that the relative absorbability of the two preparations from the lymph system of the frog is practically the same.

GERMAN DIGITALIN.

Edmunds and Roth, 1908, examined 10 samples of hypodermic tablets of digitalin which were presumably "German digitalin," and found that quite a marked variation in their activity existed, when assayed by the one-hour frog method. By the same method Hale, 1911, later assayed six samples of digitalin intended for hypodermic use, and reported a variation of over 100 per cent in their activity. It was therefore deemed of interest to ascertain whether the variation in the activity of digitalin occurring in tablets intended for hypodermic administration might not be due to a variability in the digitalin from which the commercial hypodermic tablets were made. It is quite certain that such tablets are made from the so-called "German digitalin." This statement is supported by the fact that the tablets are wholly soluble in water. The use of digitalin, German, for administration in this way is perhaps due mainly to to the fact that it is one of the least expensive of the active digitalis glucosides which can be used for this purpose.

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There are at least three distinct digitalins in commerce.[1] The "digitalinum verum" of Kiliani and Schmiedeberg is a purified product derived from commercial digitalin, German. It is an amorphous substance, soluble in 1,000 parts of water and in 100 parts of dilute alcohol, but practically insoluble in ether or chloroform. Homolle's digitalin or digitalin, French, is an amorphous substance which consists largely of the true digitalin of Kiliani. It is insoluble in water or ether, and soluble in alcohol or chloroform. Digitalin, German, is a mixture of digitalis glucosides, together with a large amount of digitonin. It is an amorphous substance which is soluble in both water and alcohol, but insoluble in ether and chloroform.

The physiological activity of digitalinum verum, digitalin, French, and digitalin, German, varies greatly, the former two being more highly active than digitalin, German. Hale's assay (Hale, 1911) showed digitalin, French, to be over five times as active as digitalin, German.

Variability in toxicity.—To determine whether any variation existed in the powdered digitalin, German, five samples were purchased on the open market and were assayed by the one-hour frog method in the usual way. The result of the assay appears below in tabulated form:

TABLE 28.—*Result of assay of powdered digitalin.*

Preparation No.	Name of maker.	Dose per gram of body weight.	Relative activity.
1	Mallinckrodt	0.000,04	4
2	Grubler	.000,05	5
3	Eimer & Amend	.000,02	2
4	Hoffman La Roche	.000,03	3
5	Merck	.000,03	3

A variation in activity of 150 per cent is shown between the least active and the most active samples. As previously stated, Hale found a variation in activity of over 100 per cent in hypodermic tablets of digitalin. The above results obtained with the powdered digitalin, German, therefore explain the reason for the variation which Hale reported. Famulener and Lyons, 1902, regarded digitalin, German, as a product which is practically constant in activity. Since the present investigation has shown it to be a variable product, it is therefore advisable to determine the activity of the powdered digitalin before the manufacture of tablet preparations, if a product of known activity be desired.

[1] New and Nonofficial Remedies.

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PROBABLE CAUSE OF INITIAL VARIATION OF FAT-FREE DIGITALIS.

The cause of the initial variation in the fat-free digitalis preparations examined must partly be conjectured. The variation in the activity of the crude drug, as well as differences in the method of the manufacture of the preparations, undoubtedly cause considerable variation in potency. Another probable reason for their variation might be the nonuniformity of the methods of assay employed by the manufacturers. For the purpose of securing accurate data on this phase of the question a letter of inquiry, asking for information relative to the methods employed for digitalis standardization, was sent to all of the firms whose preparations were examined in this investigation. In this way it was learned that of the 10 firms which these preparations represent 7 employ some form of assay, 6 use biological methods exclusively, while but 1 relies on the chemical estimation of the digitoxin content of the drug. The biological method, employed by 5 of the firms, is either the one-hour frog method or some slight modification of it. This method has been sufficiently discussed in this paper, so that it need not be given further consideration here. In addition to the one-hour frog method, 2 of these firms employed as a check the guinea pig method of Reed and Vanderkleed, 1908, which determines the minimum dose of digitalis required to kill a guinea pig weighing 240 gm. after one and one-half to two hours. As a further check, the effect upon the blood pressure of mammals is ascertained by one of the above two firms, while the other determines the toxicity of digitalis by the cat method of Hatcher and Brody, 1910. A modification of the guinea pig method of Reed and Vanderkleed was alone employed by one other firm. This firm determines the amount of digitalis which is fatal for a guinea pig of 250 gm. in weight after 24 hours. The only method employed by the remaining firm was the Houghton, 1909, 12-hour frog method. In this method the lethal dose for frogs is determined, selecting as a time limit an interval of 12 hours.

The replies to the above questionnaire disclosed the interesting fact that one of the two most active and the least active preparations were both assayed by the one-hour frog method. It is not sufficient, therefore, that the various manufacturers should use the same method of assay, but a very necessary adjunct should be the selection of a uniform standard of activity. For example, one manufacturer using the one-hour frog method might use as a standard 0.1 cc. of a tincture which would stop the heart of the *Rana pipiens* of 20 gm. weight in one hour, while another might employ 0.2 cc. as a standard dose. The standard actually employed by the above firms is an arbitrary one, and until a standard dose is determined

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upon, together with a uniform method of assay, no uniformity in the initial activity of digitalis products can be expected.

The deterioration of fat-free digitalis is shown to occur quite rapidly. In general, the preparations examined may be said to be less stable than is the official tincture of digitalis. Houghton and Hamilton, 1909, reported a yearly decrease of 9 per cent in the activity of the official tincture of digitalis, which is much less than was found in the above fat-free digitalis preparations. This may be due to the fact that the process of their manufacture is longer and more complicated than is the process for making the official tincture, and so contamination is more likely to occur. Individual preparations, however, possess excellent keeping qualities. The reason for such a wide difference in the keeping qualities, as appears between preparations 9 and 10, is unknown.

SUMMARY AND CONCLUSIONS.

A consideration of the one-hour frog method for the biological standardization of digitalis emphasizes the fact that temperature exerts a marked influence on the toxicity of certain digitalis principles in the frog. Absorption from the lymph system of the frog was shown to be variable, and was found to depend partly upon the temperature at which the animals were maintained during an assay. At the temperature of 10° C. the toxicity of certain of the digitalis glucosides is markedly lessened; coincidently the retention of the injected fluid in the lymph system of the frog is more complete. By the one-hour frog method a variation of over 250 per cent was found in 13 samples of commercial fat-free digitalis and of 150 per cent in 5 samples of commercial digitalin, German. No definite reason could be given for the initial variation in the samples of fat-free digitalis. The use of an acceptable biological method and the adoption of a standard of activity by all manufacturers are suggested as means whereby greater uniformity may be expected in the activity of commercial preparations of digitalis. The qualitative effects of fat-free digitalis on the dog were similar to those produced by the official tincture. The difference in absorbability of the fat-free tincture and the official tincture of digitalis from the lymph system of the frog was so slight as to be disregarded.

A marked deterioration in some of the samples of fat-free digitalis was found to exist after having been kept under ordinary conditions for from five to seven months; the degree of deterioration bore no constant relation to the reaction of the preparation to litmus.

In conclusion it may be said that in view of the fact that the deterioration of fat-free digitalis occurs so rapidly it is advisable that, if such preparations are to be marketed, the date of their manufacture should be stated, so that the physician may know the age of the

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preparation and not be misguided into purchasing worthless preparations.

NOTE.

After the completion of the experiments upon the effect of temperature and concentration upon absorption in frogs, which are recorded in an earlier part of this paper, a paper by Baker, 1915, came to my attention in which he reported the results of an investigation on absorption in frogs. He found that poor absorption from the lymph system was especially apt to occur during the spring and fall months and that certain preparations, such as German digitalin, digitoxin, and preparations containing acetic acid or glycerin, were usually poorly absorbed. He also found that frogs that were kept in the light absorbed better than those kept in the dark and that at higher temperatures absorption occurred more readily. Dry frogs absorbed less readily than controls which were kept in wet cages. The absorption of a 0.9 per cent sodium chloride solution was more complete than distilled water while 25 per cent alcohol was more completely absorbed than 0.9 per cent sodium chloride solution.

Although these factors modified absorption in the frog, he believed, however, that the matter of absorption was largely due to the health of the frogs and the condition under which they were kept, and that if proper attention were paid to the handling, cleaning, and storage of frogs but little difficulty would be experienced in poor absorption.

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BIBLIOGRAPHY.

AMERICAN MEDICAL ASSOCIATION.

1915—New and Nonofficial Remedies, Chicago, pp. 97, 106.

Anon.

1912—The New Institute of Pharmacology, University College, London. Brit. M. J., vol. 2, p. 1558.

BAKER, W. F.

1912—How far variations in frogs can be obviated by the use of ouabain. Am. J. Pharm., vol. 84, p. 247.

1915—Some factors in drug absorption in frogs. J. Am. Phar. Assn., vol. 4, p. 443.

BURMANN, JAMES.

1911—Die titrage physiologique des preparations de digitale d'apres la méthode de Focke. Schweiz. Wchnschr., vol. 49, pp. 218, 231.

Sur le titrage physiologique des preparations galeniques de digitale d'apres a méthode de Focke. Schweiz. Wchnschr., vol. 49, p. 416.

1914—Influence des conditions atmosphériques sur l'évolution du principe actif de la digitale. Schweiz. Apoth. Ztg., vol. 52, p. 527.

COW, DOUGLAS.

1912—Notes on some new substitutes for the galenical preparations of digitalis. Biochem. J., vol. 6, p. 219.

ECKLER, C. R.

1912—Experiments with the cat method for testing digitalis and its allies. J. Am. Pharm. Assn., vol. 1, p. 715.

EDMUNDS, CHARLES WALLIS.

1907—The standardization of cardiac remedies. J. Am. M. Assn., vol. 48, p. 1744.

EDMUNDS, CHARLES WALLIS, and ROTH, GEORGE B.

1908—Physiologic assay of nitroglycerin tablets, digitalin tablets, and fluid extract of ergot. J. Am. M. Assn., vol. 51, p. 2130.

EGGLESTON, CARY.

1913—Biological standardization of the digitalis bodies by the cat method of Hatcher. Am. J. Pharm., vol. 85, p. 99.

ENGLAND, JOSEPH W.

1899—Tincture of fat free digitalis. Am. J. Pharm., vol. 71, p. 332.

Fat free tincture of digitalis. Proc. Pennsylvania Pharm. Assn., p. 158.

FAMULENER, L. W., and LYONS, A. B.

1902—Relative strength of the various preparations of digitalis and kindred drugs as shown by experiments on frogs. Proc. Am. Pharm. Assn., vol. 50, p. 415.

FOCKE, C.

1903—Die physiologische Wertbestimmung der Digitalisblätter. Arch. d. Pharm., vol. 241, p. 128.

Näheres uber die Wertbestimmung der Digitalisblätter und uber das Verhältnis des Giftwertes zum Digitoxingehalt. Arch. d. Pharm., vol. 241, p. 669.

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FOCKE, C.—Continued.
1913—Die Weiterentwicklung der physiologischen Digitalisprüfung. Ztschr. f. exper. Path. u. Therap., vol. 14, p. 262.
1914—Weitere Schritte zur Gleichmässigkeit der officinellen Digitalispräparate. Ztschr. f. exper. Path. u. Therap., vol. 16, p. 443.
GOODALL, ALEXANDER.
1912—Tincture of digitalis: Its potency and keeping properties. Brit. M. J., vol. 1, p. 887.
GOTTLIEB, R.
1908—Ueber die physiologische Wertbestimmung von Arzneimitteln. München. Med. Wchnschr., vol. 55, p. 1265.
HALE, WORTH.
1911—Digitalis standardization and the variability of crude and of medicinal preparations. Hyg. Lab. Bull. No. 74, Washington, Govt. Print. Off.
HASKELL, CHARLES C.
1913—Influence of alcohol upon the toxicity of digitalis for guinea pigs. J. Am. Pharm. Assn., vol. 2, p. 836.
HASKELL, CHARLES C., and MILLER, F. A.
1914—Influence of heat and method of storing upon the potency of digitalis leaves. J. Am. Pharm. Assn., vol. 3, p. 306.
HATCHER, ROBERT A., and BRODY, J. G.
1910—The biological standardization of drugs. Am. J. Pharm., vol. 82, p. 360.
HATCHER, ROBERT A., and EGGLESTON, CARY.
1913—Observations on the keeping properties of digitalis and some of its preparations. Am. J. Pharm., vol. 85, p. 203.
HEINZ, R.
1912—The assay and standardization of digitalis preparations. Merck's Ann. Rep., vol. 26, suppl.
HOLSTE, ARNOLD.
1914—Zur Wertbestimmung von Herzmitteln. Ztschr. f. exper. Path. u. Therap., vol. 15, p. 385.
HOUGHTON, E. M., and HAMILTON, H. C.
1909—The pharmacological assay of the heart tonics. Am. J. Pharm., vol. 81, p. 461.
KILIANI, H.
1914—"Gitalin"—Ein Gemenge. Arch. d. Pharm. Berlin, vol. 252, p. 13.
KOBERT, RUDOLPH.
1906—Lehrbuch der Intoxikationen, vol. 2, p. 1195.
KOBERT, R.
1914—Ueber die Bewertung der Digitalis präparate mit Hilfe biologischer Methoden. Apoth. Ztg., vol. 29, p. 761.
KOLIPINSKI, LOUIS.
1913—On digitalic acid, the acid resin of *Digitalis purpurea;* its preparation, chemical reactions, physiological and therapeutic properties. Interstate M. J., vol. 20, p. 1117.
KRAFT, F.
1912—Die Glykoside der Blätter der Digitalis purpurea. Arch. d. Pharm. Berlin, vol. 250, p. 118.
LA PIERRE, E. H.
1910—Fat-free tincture of digitalis. Apothecary, vol. 22, Dec p. 18.
MARTINDALE, W. HARRISON.
1912—Digitalis assay: A comparison between physiological and chemical results with an approximate simple chemical assay method. Pharm. J. London, vol. 89, pp. 745, 778.

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MILLER, F. A., and BAKER, W. F.
1914—Comparative activity of various species and varieties of digitalis. J. Am. Pharm. Assn., vol. 3, p. 304.
PITTENGER, PAUL S., and VANDERKLEED, CHARLES E.
1915—Preliminary note on a new pharmacodynamic assay method. Carassius auratus (gold fish) as test animals for the digitalis series. J. Am. Pharm. Assn., vol. 4, p. 427.
PRATT, JOSEPH H.
1910—On the importance of determining the potency of digitalis preparations. Boston M. and S. J., vol. 163, p. 279.
RAPP, ——.
1914—Über die physiologische Wertbestimmung der Digitalisblätter und über die Enzyme der Digitalispflanze. Schweiz. Apoth. Ztg., vol. 52, p. 321.
REED, E. D., and VANDERKLEED, CHARLES E.
1908—The standardization of preparations of digitalis by physiological and chemical means. Am. J. Pharm., vol. 80, p. 110.
ROSENTHALER, L.
1914—Zur Gitalin—Frage. Schweiz. Apoth. Ztg., vol. 52, p. 349.
SCHMIEDEBERG, O.
1910—Untersuchungen über die Bestimmung des pharmakologischen Wirkungswertes der getrockneten Blätter von Digitalis purpurea. Arch. f. exper. Path. u. Pharmakol., vol. 62, p. 305.
SHARP, GORDON.
1914—Is digitalic acid (acid resin) the active principle of the digitalis plant? Pharm. J. London, vol. 92, p. 360.
SHARP, GORDON, and BRANSON, F. W.
1912—Activity of digitalis leaves, and stability and standardization of tinctures. Pharm. J. London, vol. 89, p. 131.
SHARP, J. GORDON, and LANCASTER, J.
1911—Digitalis: Some points as to time of gathering of the leaves, and the keeping properties and standardization of the tincture, etc. Pharm. J. London, vol. 86, p. 102.
SMITH, F. A. U.
1914—The relative value of the ether extractive and the dilute alcohol extractive of digitalis. Northwest. Druggist, vol. 15, p. 23.
SOLLMANN, TORALD, MENDENHALL, W. L., and STINGEL, J. L.
1915—The influence of temperature and concentration on the quantitative reaction of the heart to ouabain. J. Pharmacol. and Exper. Therap., vol. 6, p. 533.
STEWART, F. E.
1912—The pharmacist's responsibility for quality. J. Am. Pharm. Assn., vol. 1, p. 1451.
SYMES, W. LEGGE.
1914—On tincture of digitalis (B. P.): Its activity and stability. Brit. M. J., vol. 1, p. 1343.
TAMBACH, R.
1912—Zur Kenntnis der Bestandteile der Digitalisblätter. Pharm. Zentralh., vol. 53, p. 392.
WEIS, EDMUND.
1912—Über den physiologischen Wirkungswert einiger Digitalispräparate. Oesterr. San.-Wes., May 30, Beil. No. 22.
WINDAUS, A., and SCHNECKENBURGER, A.
1913—Über Gitonin, ein neues Digitalis-Glykosid. Ber. d. deuts. chem. Geselsch. Berlin, vol. 46, p. 2628.

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II. PRELIMINARY OBSERVATIONS ON METABOLISM IN PELLAGRA.[1]

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Previous workers have noted the more or less frequent occurrence in pellagrins of a variety of metabolic abnormalities, prominent among which are gastric anacidity and excessive indican excretion. A series of routine observations upon these and related points forms the chief content of the present paper. Their accumulation has in the main been incidental to a study of the part played by diet in the course, and possibly the origin, of the disease; but it was intended that they should serve also as the starting point of a more detailed investigation of its metabolism. Following, as they do, the lines suggested by our predecessors in the field, they are for the most part merely confirmatory in character, and except as they exhibit a possible effect of diet, add little that is new to our knowledge. They possess, nevertheless, a certain statistical value that renders them, we trust, not unworthy of record. Other aspects of metabolism in pellagra will, it is expected, be taken up in later studies from this laboratory. A report upon the general question involved is reserved until the data in hand shall be extensive enough to justify some definite conclusions.

THE PATIENTS AND THEIR DIET.

The patients under observation were inmates of the pellagra hospital of the United States Public Health Service at Spartanburg, S. C. All but a few were uncomplicated cases of pellagra, exhibiting the disease in various degrees of acuteness and severity. The period of hospital residence ranged in the individual cases from a few days to several months. Whether it was short or long, the patient was subject throughout to the strictest attainable regulation in respect of diet, his food being limited to one or other of a few fixed rations, and the actual consumption within that ration being carefully recorded from day to day. Any diet once initiated was altered only if the patient's physical condition or other circumstance seemed to demand a change.

[1] Manuscript submitted for publication June 30, 1915.

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The rations referred to were constituted as follows:[1]

Diet A.		Diet B.		Diet C.		Diet E.	
Lean beef	200	Corn meal	350	Raw milk	1,000	Corn meal, Grits	300
Egg	100	Grits	150	Lean beef	120	Wheat flour	150
Bread	200	Cabbage	100	Egg	100	Vegetables[a]	150
Potato (Irish)	200	Turnip	100	Bread	200	Potato[b]	150
Butter	75	Sweet potato	150	Potato (Irish)	200	Beans	50
Cream	25	Prunes	30	Rice	30	Fat salt pork	100
Jam	30	Corn sirup	30	Butter	50	Milk	100
Orange	100	Compound lard	15	Fruit	200	Corn sirup	30
Sugar	40	Sugar	20	Jam	30	Sugar	40
Coffee	300	Ham	25	Sugar	40	Coffee	300
		Pork fat	50	Coffee	300		
		Evaporated milk	33				
		Coffee	300				

	Diet A.	Diet B.	Diet C.	Diet E.
Protein:				
Animal	59	9	70	54
Vegetable	21	47	25	4
Total	80	56	95	58
Fat	85	80	100	104
Carbohydrate	220	495	304	478
Calories	2,020	2,988	2,564	3,164

[a] Cabbage, turnips, greens, rutabagas, carrot, collards, etc. [b] Irish or sweet.

Diet A, "meat diet," was planned as an adequate[2] diet with a relatively high content of animal protein in the form of meat and egg; such a diet as, according to all previous experience, might be expected to have a favorable influence upon the course of the disease. *Diet B*, "vegetable diet," possessed as its main characteristics a low protein content, a large proportion of vegetables, a predominance of corn over other cereals, and a deficiency in fresh meat. In these respects we believed it to be representative of the diet of the population among whom pellagra is endemic. *Diet C*, "meat and milk diet," was similar in general character to *A*, from which it differed chiefly by including a considerable quantity of fresh milk. *Diet E*, "modified vegetable diet," was employed chiefly as a relief from the monotony of *B*, from which it differed in the partial replacement of corn by wheat and in the introduction of greater variety among the vegetables allowed; to meet special circumstances other unessential changes were occasionally permitted.

It would be superfluous to detail in this place the clinical histories of the cases hereafter to be referred to; but as these are not altogether without bearing upon some of our results, we have attempted in the lines following to indicate briefly the general type of pellagra which each patient illustrated, and the course which the disease took during the period of our observations.

[1] The amount of each food item is given in grams, except in the cases of milk and coffee, where the unit is the cubic centimeter. The protein content of the diets is calculated from our own analyses, the other components and the caloric value from figures in Bulletin 28, U. S. Department of Agriculture.

[2] Adequate, in all probability, for the patients receiving it, although it might with advantage have contained more carbohydrates.

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CASE 1. Female, age 36. Mild, chronic. Skin lesions slight. Chief symptoms, dizziness and loss of memory. Gradual, slight improvement with considerable gain in weight.

CASE 2. Male, age 22. Acute, severe, with extensive eruption on upper and lower limbs, face, and groin. Gastric discomfort and dizziness. Apparently complete recovery.

CASE 3. Female, age 28. Mild, acute. Erythema extending beyond elbows; sore mouth; burning sensations; dizziness; and depression. Somewhat improved.

CASE 4. Male, age 32. Severe, chronic. Forearm and hands desquamating; chronic gastritis; diarrhea; emaciation; and depression. No improvement.

CASE 5. Female, age 46. Very mild, chronic case. Complicated by gallstones. Improved.

CASE 8. Female, age 20. Mild, chronic, with slight skin lesions. Improved.

CASE 9. Female, age 24. Mild, chronic. Slight dermatitis; weakness; nervousness; and tachycardia. Improvement.

CASE 10. Female, age 26. Mild, chronic. Greatly improved.

CASE 13. Female, age 30. Of same type as case 10. Improved.

CASE 14. Male, age 58. Severe, acute. Severe eruption on hands; diarrhea; dizziness; stinging pains. Apparently complete recovery.

CASE 16. Female, age 26. Moderately severe chronic. Mild erythema; dizziness; nervousness; burning sensations; recurrent vomiting. Little improvement.

CASE 17. Female, age 32. Mild, chronic. Not improved.

CASE 19. Female, age 24. Mild, chronic. Slight dermatitis of arms and hands; slightly sore mouth. Great improvement and gain in weight.

CASE 22. Female, age 17. Severe, acute. Dermatitis on hands, arms, and neck; sore mouth; diarrhea. Complicated by syphilis. Little improvement.

CASE 25. Female, age 28. Severe, acute. Erythema of hands, arms, shoulders, neck, chest, and face; sore mouth; diarrhea; prostration; nervousness; and giddiness. Greatly improved.

CASE 27. Female, age 42. Moderately severe, chronic. Great depression. Not improved.

CASE 29. Female, age 39. Mild, chronic. Little change.

CASE 30. Female, age 26. Mild, chronic. Complicated by multiple neuritis, probably arsenical. Not much improved.

CASE 31. Female, age 40. Severe, acute. Extensive dermatitis of hands, arms, feet, and neck; diarrhea; dizziness. Became insane and died.

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CASE 32. Female, age 32. Mild, acute. Erythema of hands and forearms; sore mouth; nervousness; dizziness; and burning sensations. Slight improvement.

CASE 35. Female, age 42. Moderately severe, chronic. Dermatitis of hands and wrists; burning, gastric discomfort; extreme dizziness. Very considerable improvement.

CASE 36. Male, age 55. Severe, acute. Dermatitis of hands and arms; sore mouth; diarrhea; great depression with intervals of excitement; extreme weakness and loss of weight. At first grew worse; afterwards very greatly improved, if not completely recovered.

CASE 40. Female, age 39. Mild, chronic. Slight dermatitis; weakness; nervousness; and burning sensations. Slightly improved, with considerable gain in weight.

CASE 41. Male, age 40. Mild, subacute. Sore mouth; giddiness; gastric discomfort; noises in head. No change.

CASE 42. Male, age 21. Moderately severe, acute. Sore mouth; diarrhea; giddiness; extreme weakness. Greatly improved.

CASE 43. Female, age 50. Moderately severe, chronic. Symptoms mainly gastric, with sore mouth. No improvement.

CASE 44. Female, age 25. Rather severe, acute. Erythema of hands; sore mouth; diarrhea. Somewhat improved.

CASE 45. Male, age 56. Rather severe, chronic. Sore mouth; weakness; confusion; anemia. No change.

CASE 46. Male, age 50. Mild, chronic. Slight dermatitis; weakness; giddiness. Considerable improvement.

Gastric analyses.—Within the first few days after admission each patient was given the Ewald test breakfast, and gastric contents were obtained in the usual way after an interval of one hour. Total and free acidity were determined by titration to phenolphthalein and dimethylaminoazobenzene, respectively. The pepsin content was estimated by the ricin method of Jacoby;[1] in a few of the later analyses by Rose's pea-globulin method as modified by Givens.[2] The presence or absence of bile was noted, and a portion of the contents, rendered alkaline by the addition of an equal volume of 0.5 per cent sodium carbonate, was tested for trypsin. When the latter was present, its amount was estimated by the Fuld-Gross method as described by Wohlgemuth.[3] Whenever the results of the examination were doubtful, the test meal was repeated. It was repeated in any case at intervals (generally of about a month), whenever the patient's stay in hospital was prolonged. The results of all analyses are included in Table I, where they are arranged in order of increasing free or, where that is zero, total acidity.

[1] See Wohlgemuth, Grundriss der Fermentmethoden, Berlin, 1913, p. 146.
[2] Bull. Hyg. Lab. 101.
[3] Wohlgemuth, Grundriss der Fermentmethoden, Berlin, 1913, p. 187.

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TABLE I.

Case No.	Date.	Diet, with date of its institution.	Gastric contents.						Notes.
			Volume.	Acidity.		Pepsin.	Trypsin.	Bile.[1]	
				Total.	Free.				
32	Nov. 7, 1914	B, Oct. 19...	80	6	0	0	0	0	
	Dec. 5, 1914	A, Nov. 28..	20	6	0	0	.....	0	Vomitus, 2 hours after dinner.
17	Sept. 8, 1914	B, Sept. 4...	71	8	0	0	25	**	
	Sept. 10, 1914	.....do.....	240	57	47	15	0	0	HCl with test meal.
22	Oct. 14, 1914	B, Sept. 22..	83	11	0	0	0	0	
	Dec. 17, 1914	A, Dec. 16...	160	5	0	0	0	0	
	Jan. 16, 1915	.....do.....	(?)	7	0	0	0	0	
45	Oct. 8, 1914	B, Oct. 2....	93	11	0	0	16	0	
14	Sept. 3, 1914	C, Sept. 2...	65	11	0	0	80	**	
	Sept. 8, 1914	.....do.....	77	12	0	0	30	**	
	Sept. 9, 1914	.....do.....	350	78	68	20	0	0	HCl with test meal.
	Oct. 17, 1914	.....do.....	110	9	0	0	.....	.....	
	Nov. 24, 1914	.....do.....	50	14	0	0	4	*	1.25 cc. 10 per cent HCl after each meal, Oct. 20–Nov. 20.
	Dec. 30, 1914	.....do.....	112	18	0	0	48	0	$NaHCO_3$ and $KHCO_3$ aa 0.4 gm. before meals, Nov. 27–Dec. 28.
	Jan. 1, 1915	.....do.....	104	alk.	.....	0	6	.....	$NaHCO_3$ and $KHCO_3$ aa 1 gm. with test meal.
35	Nov. 2, 1914	B, Oct. 30...	60	13	0	0	48	*	
	Dec. 14, 1914	E, Dec. 7....	65	15	0	0	64	*	
42	Dec. 23, 1914	B, Dec. 14...	179	13	0	0	0	0	
31	Nov. 3, 1914	B, Oct. 18...	68	14	0	4	0	0	
25	Oct. 8, 1914	B, Sept. 29..	140	14	0	6	32	.....	
	Nov. 7, 1914	.....do.....	67	18	0	0	50	.....	Received "vitamine" Oct. 12–Nov. 4.
44	Dec. 28, 1914	A, Dec. 23...	16	15	0	0	0	0	
43	.....do.....	B, Dec. 21...	62	17	0	0	64	**	
2	Sept. 2, 1914	C, Aug. 17...	86	21	0	0	65	***	
	Sept. 8, 1914	.....do.....	134	24	0	30	85	**	
	Sept. 9, 1914	.....do.....	300	81	72	40	0	***	HCl with test meal.
	Oct. 17, 1914	.....do.....	144	24	0	4	.....	**	
	Nov. 24, 1914	.....do.....	153	14	0	0	32	**	2.25 cc. 10 per cent HCl after each meal, Oct. 20–Nov. 20.
	Dec. 22, 1914	.....do.....	52	17	0	0	128	**	$NaHCO_3$ and $KHCO_3$ aa 0.4 gm. before meals Nov. 27–Dec. 20.
	Dec. 30, 1914	.....do.....	100	18	0	0	128	**	
	Jan. 1, 1915	.....do.....	92	alk.	.....	0	128	**	$NaHCO_3$ and $KHCO_3$ aa 1 gm. with test meal.
4	Sept. 2, 1914	B, Sept. 2...	57	25	0	0	40	*	
	Sept. 9, 1914	.....do.....	122	72	70	*	0	0	HCl with test meal.
5	Sept. 5, 1914	Mixed.....	14	27	0	0	40	0	
	Dec. 16, 1914	.....do.....	10	9	0	0	.....	.....	
	Jan. 16, 1915	.....do.....	2	(?)	0	0	10	.....	
36	Oct. 15, 1914	B, Oct. 13...	1	*	0	*	(?)	.....	
	Feb. 11, 1915	C, Nov. 16...	10	7	0	0	6	.....	
19	Oct. 14, 1914	B, Sept. 11..	65	19	9	16	0	0	
40	Dec. 9, 1914	C, Dec. 2....	100	30	11	8	16	**	
	Jan. 14, 1915	A, Dec. 24...	75	17	0	0	24	*	
29	Nov. 3, 1914	B, Oct. 14...	2	36	18	30	0	0	

[1] "0" signifies an absence of bile, "*" a faint but unmistakable trace, "**" a moderate amount, and "***" considerable bile present.

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TABLE I—Continued.

Case No.	Date.	Diet, with date of its institution.	Gastric contents.						Notes.
			Volume.	Acidity.		Pepsin.	Trypsin.	Bile.[1]	
				Total.	Free.				
3	Sept. 3, 1914	B, Sept. 2...	135	49	33	8	0	0	
	Sept. 10, 1914	.....do.....	192	71	61	40	.....	.....	HCl with test meal.
	Nov. 7, 1914	.....do.....	48	85	70	16	0	.....	Received "vitamine" Oct. 12–Nov. 4.
41	Dec. 9, 1914	B, Dec. 7....	130	48	34	8	4	**	
	Jan. 14, 1915	E, Jan. 1....	145	55	38	66	0	*	
46	Oct. 13, 1914	B, Sept. 29..	.....	.....	*	*	.....	.....	Only washings of stomach obtained.
	Dec. 16, 1914	A, Nov. 20..	47	63	38	34	0	0	
27	Oct. 13, 1914	B, Oct. 8....	47	70	41	0	0	0	
10	Sept. 3, 1914	B, Sept. 2...	130	60	42	80	0	0	
16	Sept. 4, 1914	C, Aug. 31...	45	56	42	60	0	**	
	Dec. 30, 1914	.....do.....	87	63	50	66	.....	**	Meat omitted from diet since Oct. 3.
30	Nov. 3, 1914	Mixed.....	18	74	44	30	.....	.....	
	Dec. 16, 1914	.....do.....	25	59	47	34	0	*	
9	Sept. 3, 1914	B, Sept. 2...	32	72	47	40	0	.....	
	Dec. 14, 1914	E, Dec. 6....	7	54	35	30	0	0	
	Jan. 15, 1915	A, Dec. 22...	34	51	32	66	.....	0	
8	Sept. 4, 1914	B, Sept. 2...	53	74	51	60	0	0	
1	Sept. 3, 1914	B, Sept. 2...	123	74	52	40	0	0	
	Dec. 15, 1914	.....do.....	65	76	50	32	.....	.....	
	Jan. 15, 1915	E, Jan. 1....	60	69	53	66	0	0	
13	Sept. 4, 1914	B, Sept. 2...	110	70	54	80	0	0	

Of the 29 individuals appearing in Table I, 15, or 52 per cent, showed an entire absence of free HCl in the gastric contents; in 3 (10 per cent) the free acidity was decidedly subnormal; while in 11 (38 per cent) it was up to or beyond what is generally regarded as the normal limit. In Table II these results are compared with previous observations upon the same point. Available data would make it appear that in about three-fourths of all cases the free acid of the gastric contents may be expected to be subnormal, and in about half entirely absent.

TABLE II.

Authority.	Number of cases.	HCl absent.		HCl deficient.	
		Number.	Per cent.	Number.	Per cent.
Cecconi[1]	12	12	100	.....	.....
Johnson[1]	20	14	70	.....	.....
Niles[2]	64	18	28	31	48
Myers and Fine[3]	14	8	57	.....	.....
Hunter, Givens, and Lewis	29	15	52	3	10
Total	139	67	48	34	24

[1] Quoted from Myers and Fine, Amer. Journ. Med. Sci., cxlv, p. 705, 1913.
[2] Niles, Pellagra, 1912, p. 77.
[3] Myers and Fine, *loc. cit.*

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Niles expressed the opinion that a deficiency in the secretion of acid was to be expected in most cases of long standing. In our experience it seemed to be associated rather with relatively severe stomatitis and an acute skin lesion, whether the attack was a first one or a recurrence, while cases showing a normal acidity were mostly of a mild but chronic type. To both statements, however, as will appear from a glance at our description of the individual cases, there were some exceptions; and it does not seem to us possible yet to correlate the absence of free HCl with any single clinical type of the disease.

When the gastric contents were of normal acidity pepsin was present in reasonable amounts. The only exceptions to this rule were met in cases 3, 41, and 27. On the other hand, a deficiency or absence of acid is all but invariably associated with a lack of pepsin. The absence of pepsin in such circumstances does not necessarily imply that the secreting cells have entirely lost the power to manufacture the enzyme. It may signify merely that the conditions produced by the failure of HCl lead to the destruction of pepsin or pepsinogen as soon as it appears in the stomach. We have obtained some evidence that this is actually the case. Once, for instance (case 2, Sept. 8), pepsin was found in a stomach from which it was usually absent. Again, on four occasions (see cases 17, 14, 2, and 4) we supplied the missing acid along with the test meal[1] each time the gastric contents subsequently withdrawn exhibited a notable peptic activity. In a fifth experiment (case 3, Sept. 10) the administration of acid increased the pepsin content even of a stomach whose acidity was apparently normal. It is demonstrated that in these five cases at least the capacity to produce pepsin had not been permanently diminished or lost. We incline, therefore, to view the absence of pepsin in pellagra as a secondary effect, and to regard the gastric lesion as one which affects primarily the acid-producing mechanism alone. It is, of course, quite possible that after a time the stomach loses also the power to manufacture its characteristic enzyme.

We have observed that the stomach from which free acid and pepsin are absent almost always contains trypsin, sometimes in very considerable concentration. Though we do not remember having seen this combination of circumstances noted before, there is nothing in it that is surprising.[2] When the chyme is insufficiently acid, the mechanism regulating the closure of the pylorus will be in abeyance, and a regurgitation of the duodenal contents might be anticipated. The regurgitation is evidenced not only by the appearance of trypsin in the stomach, but frequently also by the presence there of

[1] Instead of 400 cc. of weak tea the patient received, in several doses, 400 cc. of N/10 HCl.

[2] Since submitting the manuscript for publication there has come to our attention the recent work of Landau and Rzasnicki (Ztschr. f. klin. Med., lxxx, p. 307, 1914), who found a similar condition in pathological cases other than pellagra.

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bile. Trypsin was not to be expected, and was in fact not found, in the cases where HCl was given by mouth, or where gastric acidity was normal or increased. In some of these cases, to be sure, there was regurgitation, as shown by the presence of bile; but if, as is probable, pancreatic juice accompanied the bile, its trypsin would, of course, be rapidly destroyed in the normally constituted gastric secretion. Conversely, the entrance, with anacidity, of active trypsin into the stomach is perhaps one of the factors responsible for the disappearance of pepsin.[1]

Our trypsin results show that while the pathology of pellagra may involve the complete suppression of gastric digestion, the function of the pancreas is not appreciably affected. This would account for the circumstance that pellagrins are able, even in the entire absence of pepsin-hydrochloric acid, to utilize protein as well, or nearly as well, as healthy individuals.[2]

The condition of gastric anacidity, once established, appears to be very resistant to treatment, and, indeed, so far as our observations go, quite irremediable. This is illustrated particularly by cases 2 and 14. In these the interval between the first and last test meal was four months; yet in neither is there any appreciable change in the character of the gastric contents. This is the more striking in that during the same interval these two patients passed, under the influence of a meat and milk diet, from a condition of severe and typical acute pellagra to one where practically no external sign or subjective symptom of the disease remained. Such therapeutic measures as were attempted with a view to stimulating the secretion of acid (one month's administration of small doses of HCl after meals and a similar period of treatment with alkaline bicarbonates before meals) were entirely without avail. It seems probable, therefore, that the failure of HCl is the consequence of some permanent anatomical lesion of the gastric mucous membrane. In not one of our cases did we observe any indication whatever of a return of acid to a secretion from which it was originally wanting.

INDICAN DETERMINATIONS.

So far as it was possible we obtained from each patient, after he had become accustomed to a definite diet, at least one 24-hour specimen of urine. This was utilized not only in the routine examination for pathological constituents, but also in the quantitative estimation of the output of indican. In many cases the daily determina-

[1] In some more recent gastric analysis on normal persons it was found that while bile and a small quantity of trypsin may appear under certain circumstances in the gastric contents, this fact may be explained by the extreme reflex contractions of the abdominal musculature as a result of the passage of the stomach tube. By this mechanism duodenal contents may be forced into the stomach in spite of the presence of free acid in this latter organ. The presence of bile and small amounts of trypsin in the stomach contents of some pellagrins must therefore not be considered as pathological.

[2] See Myers and Fine, *loc. cit.*, and our own experiments reported later in this paper.

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tion of indican was continued over a longer or shorter period; in some a second series of determinations was made after an interval of weeks or months.

In carrying out the estimation a sample of the day's urine was defecated with solid lead acetate, and a suitable aliquot part of the filtrate was treated with Obermayer's reagent. The resulting indigo was thoroughly extracted with chloroform, and the chloroform solution, made up to a definite volume, was compared in the colorimeter with an appropriately diluted Fehling's solution. In a preliminary series of tests the colorimeter reading was compared with the result of titrating the residue of the washed and evaporated chloroform extract with potassium permanganate according to Ellinger,[1] and from the data thus obtained a formula was constructed enabling us to convert colorimeter readings directly into milligrams of indican. Of course, we can not claim for the values so obtained anything like ideal accuracy, but we believe them to represent a reasonably close approximation to exactness.

During the execution of the indican determinations it was noticed that the urine of many of our patients yielded a deep red color upon simple acidification with pure hydrochloric acid. Thinking that this, the so-called "urorosein" reaction, might prove to be of some significance, we included observations upon its occurrence in our regular routine. The test was carried out in such a manner as to yield comparable results with different urines. A portion of the filtrate after lead acetate treatment was so diluted that a given volume represented always the same fraction of the day's urine; to 10 cc. of the product there were added 10 drops of concentrated HCl; if no color developed more HCl was added till the total volume was 20 cc.; if the reaction still failed to appear 0.1 per cent $NaNO_2$ was added by shaking a drop at a time, and from the results of these tests the relative amount of the reacting substance was crudely estimated. According to Herter[2] the chromogen of this reaction is indole-acetic acid, and we have recorded our results under that heading. From unpublished observations of Dr. Annie Homer[3] it would appear that sometimes at least we were dealing in reality with indole-aceturic acid, but as the physiological significance of the two substances in urine is alike, we have not attempted to maintain any distinction.

Estimations of indican and indole-acetic acid were made altogether in 23 cases. The results are shown in Table III, where the patients are arranged in the same order as in Table I. The indican figures represent milligrams of that substance.[4] Under indole-acetic acid "0"

[1] See Hawk, Practical Physiological Chemistry, 4th ed., Philadelphia, 1912, p. 416.
[2] Herter, Journ. Biol. Chem., iv, p. 253, 1908.
[3] For this information we are indebted to a personal communication from Miss Homer.
[4] When 1 mgm. is reported, this is intended to signify an indeterminable trace.

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signifies that the reaction was absent or extremely faint; "*" means faint but unmistakable; "**" moderate; "***" strong, and "****" exceedingly strong.

TABLE III.

Case.	Date.	Diet.	Indican.	Indole-acetic acid.
	1914.			
32.....	Nov. 13	B	0	***
	14	B	0	***
	15	B	1	**
	16	B	8	**
	17	B	22	**
	18	B	40	0
	19	B	36	0
	20	E	10	*
	21	E	24	*
	22	E	28	***
	23	E	1	**
	24	E	24	**
	25	E	1	*
	26	E	25	*
	27	E	28	*
	28	E	1	*
	29	A	41	0
	30	A	31	0
	Dec. 1	A	18	0
	2	A	27	*
	3	A	22	*
	4	A	29	*
	5	A	63	**
22.....	Oct. 23	B	0	**
45.....	Oct. 5	B	0	*
	6	B	28	**
	9	B	33	**
	12	B	1	****
14.....	Sept. 20	C	184	0
	21	C	184	0
	22	C	156	0
	24	C	136	0
	25	C	98	0
	26	C	120	0
	27	C	130	0
	28	C	130	0
	30	C	142	0
	Oct. 1	C	142	0
	3	C	136	0
	5	C	125	0
	7	C	104	0
	9	C	104	0
	12	C	92	0
	13	C	87	0
	Dec. 10	C	44	0
	11	C	48	0
	12	C	62	0
	13	C	59	0
	14	C	57	0
	15	C	121	0
	16	C	62	0
35.....	Nov. 8	B	17	**
	Dec. 10	E	35	*
	11	E	34	0
	12	E	25	**
	13	E	29	*
	14	E	42	*
	16	E	40	0
	17	E	30	*
42.....	Dec. 16	B	99	****
	17	B	63	****
	18	B	71	****
	19	B	33	****
	20	B	49	****
	21	B	47	****
	1915.			
	Jan. 14	E (1)	70	***
	15	E (1)	75	***
	16	E (1)	50	***
	17	E (1)	59	***
	18	E (1)	78	**
	19	E (1)	52	**
	20	E (1)	48	**
	21	E (1)	40	**
	22	E (1)	46	**
	23	E (1)	38	**
	1914.			
31.....	Oct. 23	B	0	**
	Dec. 19	C	120	*
25.....	Oct. 5	B	0	0
	11	B	20	*
	26	B (2)	21	0
	Nov. 1	B (2)	1	*
2.....	Sept. 23	C	74	0
	25	C	66	0
	27	C	42	0
	28	C	37	0
	29	C	32	0
	Oct. 1	C	44	0
	3	C	42	0
	5	C	33	0
	7	C	40	0
	9	C	34	0
	12	C	9	0
	13	C	14	0
	Dec. 10	C	25	0
	11	C	39	0
	12	C	32	0
	13	C	26	0
	14	C	34	0
	15	C	36	0
	16	C	43	0
5.....	Dec. 10	Mixed.	16	0
	11	Mixed.	5	0
	12	Mixed.	17	0
	13	Mixed.	17	*
	14	Mixed.	24	0
	16	Mixed.	25	0
	17	Mixed.	27	0
36.....	Oct. 16	B	14	**
	17	B	35	****
	20	B	30	****
	22	B	4	***
	24	B	11	****
	26	B	31	****
	28	B	20	***
	30	B	16	**
	Nov. 9	B	8	**
	11	B	9	*
	13	B	16	**
	16	B	45	*
	Dec. 10	A	76	**
	11	A	62	0
	12	A	113	0
	13	A	140	0
	14	A	67	0
	15	A	49	0
	16	A	127	0
	17	A	90	0
	18	A	144	*
	19	A	99	*
	20	A	102	0
	21	A	102	0

[1] Included yeast "vitamine" and about 400 cc. milk.

[2] Included "vitamine."

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TABLE III—Continued.

Case.	Date.	Diet.	Indican.	Indole-acetic acid.
	1914.			
19.....	Nov. 6	B	0	****
	9	B	0	****
	11	B	0	****
	13	B	0	****
	16	B	0	***
	18	B	0	***
	20	B	0	**
	23	B	0	**
	25	B	0	**
	27	B	0	**
	30	B	0	**
40.....	Dec. 13	C	29	**
	15	C	65	**
	16	C	41	**
	17	C	57	**
	18	C	132	**
	19	C	60	**
	20	C	52	**
	21	C	70	**
29.....	Oct. 19	B	5	**
3.....	Oct. 23	B (1)	0	**
	24	B (1)	1	*
	Nov. 1	B (1)	0	**
41.....	Dec. 10	B	15	0
	11	B	21	***
	12	B	23	***
	13	B	22	**
	14	B	11	**
	17	B	13	*
	18	B	19	*
46.....	Oct. 17	B	1	***
	20	B	1	***
	22	B	10	****
	Oct. 24	E	13	***
	26	E	14	***
	28	E	13	***
	30	E	17	***
	Nov. 2	E	9	**
	4	E	10	***
	6	E	10	*
	9	E	12	*
	11	E	23	*
	Dec. 10	A	24	*
	11	A	24	*
	12	A	37	*
	13	A	31	**
	14	A	36	*
	15	A	38	*
	16	A	22	**
27.....	Oct. 11	B	0	**
	12	B	0	*
	16	B	0	*

Case.	Date.	Diet.	Indican.	Indole-acetic acid.
	1914.			
16.....	Sept. 13	C	50	0
	14	C	57	0
	17	C	48	0
	18	C	31	0
	20	C	25	0
	21	C	30	0
	22	C	50	0
	23	C	25	0
	Oct. 3	C	38	0
	Dec. 10	C (2)	18	0
	11	C (2)	21	0
	12	C (2)	40	0
	13	C (2)	51	0
	14	C (2)	40	0
	15	C (2)	48	0
	16	C (2)	44	0
30.....	Dec. 10	Mixed.	19	**
	11	Mixed.	4	**
	12	Mixed.	12	**
	13	Mixed.	20	**
	14	Mixed.	33	*
	15	Mixed.	11	*
	16	Mixed.	20	0
9.....	Oct. 5	B	0	0
	7	B	0	0
	9	B	0	0
	Dec. 10	E	9	*
	11	E	17	0
	12	E	18	0
	13	E	26	*
	14	E	18	0
	16	E	31	0
	17	E	31	0
1.....	Oct. 20	B	1	****
	22	B	0	****
	24	B	1	****
	26	B	1	****
	28	B	0	****
	30	B	0	****
	Nov. 2	B	0	***
	4	B	0	***
	6	B	1	***
	9	B	0	***
	11	B	0	****
	13	B	0	***
	16	B	0	***
	18 (3)	B	0	****
	19 (4)	B	0	****
	20 (5)	B	0	****
	21	B	0	****
	23 (6)	B	0	****
	24	B	0	****
	25 (7)	B	0	***
	26 (8)	B	0	****
	27	B	0	**
	30	B	0	**
13.....	Oct. 3	B	0	***
	5	B	0	***

[1] Included "vitamine."
[2] With meat juice in place of meat.
[3] 0.5 gm. tryptopnane per os (in two doses) on 17th.
[4] The same on 18th.
[5] 1.0 gm. tryptophane (in three doses) on 19th.
[6] 50 gms. casein (in two doses) on 23d.
[7] 100 gms. casein (in three doses) on 24th.
[8] The same on 26th.

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In the next table (Table IV) the figures of the preceding one have been reduced to averages; a fresh average being drawn whenever a change of diet has taken place, or a considerable period of time has intervened between determinations.

TABLE IV.

Case.	Date.	Diet.	Indican.	Indole-acetic acid.	Free acid in stomach.
32	Nov. 13-19	B	15	**	
	Nov. 20-28	E	16	**	
	Nov. 29-Dec. 5	A	33	*	
22	Oct. 23	B	0	**	
45	Oct. 5-12	B	16	**	
14	Sept. 20-Oct. 13	C	129	0	
	Dec. 10-16	C	65	0	
35	Nov. 3	B	17	**	
	Dec. 10-17	E	34	*	
42	Dec. 16-21	B	60	****	Absent.
	Jan. 14-23	E	55	**	
31	Oct. 23	B	0	**	
	Dec. 19	C	120	*	
25	Oct. 5-Nov. 11	B	10	*	
2	Sept. 23-Oct. 13	C	39	0	
	Dec. 10-16	C	34	0	
5	Dec. 10-17	Mixed.	19	0	
36	Oct. 16-Nov. 16	B	21	***	
	Dec. 10-21	A	100	0	
19	Nov. 6-30	B	0	***	
40	Dec. 13-21	C	63	**	Diminished.
29	Oct. 19	B	5	**	
3	Oct. 23-Nov. 1	B	0	**	
41	Dec. 10-18	B	18	**	
46	Oct. 17-22	B	4	***	
	Oct. 24-Nov. 11	E	13	**	
	Dec. 10-16	A	30	*	
27	Oct. 11-16	B	0	*	
16	Sept. 13-Oct. 3	C	39	0	Normal or increased.
	Dec. 10-16	C	37	0	
30	Dec. 10-16	Mixed.	17	*	
9	Oct. 5-9	B	0	0	
	Dec. 10-17	E	21	0	
1	Oct. 20-Nov. 30	B	0	****	
13	Oct. 3-5	B	0	***	

There is some uncertainty as to the level at which the excretion of indican becomes pathological. According to Borden [1] the average daily output of *indoxyl* for a healthy subject may be set at about 6 mgm.; and he considers it "compatible with health for a person to excrete daily over a considerable period anywhere from 5 to 10 mgm. of indoxyl while an occasional excretion of 15 to 20 mgms. may occur without causing any notable symptoms." To speak in terms of indican these figures would have to be just doubled. On this basis it would probably be fair, so long as we are dealing with the average of a considerable period, to consider 25 mgms. as the upper limit of normality; while 50 mgms. might be taken as allowable for a single maximum. It is evident at a glance that in comparison with such standards many of the figures in Tables III and IV are decidedly high.

[1] Borden, Journ. Biol. Chem., ii, p. 575, 1907.

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A "marked reaction for indican," "indican increased," and the like are expressions frequently enough encountered in clinical reports upon cases of pellagra.[1] More often than not, however, they have reference merely to qualitative tests applied to haphazard specimens of urine, and are therefore absolutely meaningless. The only series of quantitative estimations of the indican output of pellagrins with which we are acquainted is that of Myers and Fine.[2] This includes 14 cases in which determinations were made daily for periods that were seldom shorter than a week. Of the 16 averages drawn from these cases the lowest is 21, the highest 240 mgms.; and all but two are above the standard we have decided to accept as normal. Myers and Fine conclude that "individuals suffering from pellagra show a marked indicanuria"; and find, on a further analysis of their data, that this indicanuria is "excessive in the cases with gastric inefficiency."

The indicanuria of our own series is neither so frequent nor so extreme. Our 23 cases yield (in Table IV) 35 averages. Of these only 14 (10 cases) are unmistakably high, 13 (11 cases) are "normal," while there are no less than 8 instances (in as many cases) of the complete, or almost complete, absence of indican. It is clear, then, that the existence of pellagra is compatible with any degree whatever of indican production, even with none at all, and that indicanuria, undeniably a common feature of the disease, is by no means an essential one. Further, it is true that the incidence of indicanuria is greatest among cases with a deficiency of gastric acid; of 22 averages from such cases, 11 are abnormally high, while among the 13 from cases with abundant HCl there are only 3 that can be called excessive. But the association of hypoacidity with indicanuria is very far from constituting an absolute rule; for cases deficient in HCl supply 8 instances of an entirely normal indican output, and 2 (cases 31 and 19) of its complete absence. In determining the extent of indican formation, gastric efficiency is evidently only one of the factors involved. Our results indicate that at least one other, and a very important one, is to be found in the patient's diet. It will be seen, on inspection of the tables, that all the instances of excessive indican output are associated with an animal diet (A or C); while all those where indican is absent are found among patients on a vegetable régime (B). The effect of diet may be seen even in the history of individual cases. Four (31, 32, 36, and 46) passed during their stay in hospital from vegetable to animal food; in each the change was accompanied by a notable increase in the indican excretion. In some of our earlier cases so striking was the contrast thus presented, that

[1] See, e. g., Tucker, Journ. Amer. Med. Assoc., lvi, p. 246, 1911; Ormsby and Singer, Arch. Int. Med., x, p. 122, 1912.

[2] Myers and Fine. *loc. cit.*

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we were inclined for a time to believe that a vegetable diet might be invariably relied on to prevent or suppress an indicanuria. Later we recognized that this was hardly the case. Some pellagrins continue, if they suffer from a deficiency of HCl, to excrete large quantities of indican even on diets B or E. This is shown by case 35 and still more strikingly by case 42, in each of whom the factor of anacidity seems to have outweighed the opposing factor of diet.

The cases last referred to emphasize the danger of making hasty inductions from a limited number of observations; it is therefore only as a tentative résumé of our results to date that we venture the following generalizations:

(1) The pellagrin whose gastric HCl has not suffered diminution will excrete on a vegetable diet either no indican at all, or at most a moderate amount; but if he is on a meat diet his indican output may be excessive.

(2) The pellagrin with diminished gastric acidity will always show an excessive indican output when his diet is animal; on a vegetable diet indican may be absent, moderate, or high.[1]

We have naturally asked ourselves the question, why diets like B and E, possess a tendency to inhibit the formation of indican. The answ er which first suggests itself is that these diets are poorer in protein than the others, that the protein, moreover, is largely derived from cereals, and that accordingly there will be available to the intestinal bacteria under the vegetable régime too little tryptophane to permit of an extensive development of indole. This simple explanation would appear to be inadequate; for, (1) an excess of indican *may* be produced, as with cases 35 and 42, even on a vegetable diet; (2) when indican is absent its place is very frequently taken, as we shall see, by another derivative of tryptophane; (3) the addition of tryptophane or tryptophane containing protein to a vegetable diet does not have the effect of increasing urinary indican. The last statement we base upon an experiment performed with case 1, the details of which appear in Table III. It will be seen there that tryptophane was administered to this patient on three successive days without it being possible to detect any resulting indican formation. As this might very well be accounted for by the too rapid absorption of the free amino-acid, we further added to the diet (again on three successive days) roughly equivalent amounts of casein; even then the urine failed to show any indican appreciable by the Obermayer reaction.

[1] In this provisional statement of conclusions, as in general throughout the paper, the terms "meat," "animal," "vegetable," etc., are to be understood merely as descriptive of such rations as A and C on the one hand, and B and E on the other. It is to be regretted that we do not as yet know precisely what influence these particular diets would have upon the indican output of entirely normal individuals. This lack of controls we hope to remedy at a later date.

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The simple hypothesis thus tested having failed, we are disposed to seek an explanation among the following considerations. The medium offered by the intestinal contents during the vegetable régime is certainly very different from that presented by a meat diet. This might, on the one hand, have the effect of so altering the intestinal flora that indole-formers largely disappear;[1] or, on the other, without causing any change in the species actually present, may so modify their biochemical activities that other than the familiar products of putrefaction are produced. We have made no direct observations on the chemical or bacterial composition of the feces of our pellagrins; but our records furnish indirect evidence that one or other of the possibilities mentioned really came into play.

We have, for instance, repeatedly noticed the circumstance that, while the feces of patients on diet A or C are alkaline, those on B or E have stools that are acid to litmus. More directly related to the point in question are our observations on the excretion of indole-acetic acid. These observations are quantitative only in the roughest sense; but, with due allowance made for this deficiency, a reference to Tables III and IV will show that in a general way, and with few exceptions, the output of indole-acetic acid stands in inverse ratio to that of indican. With a meat diet the former is never prominent and oftenest absent; with a vegetable diet it is usually present in considerable amounts,[2] and is most frequently abundant when the indican excretion is insignificant. There is but one instance (case 42) where both substances are simultaneously present in excess, and one (case 9 on diet B) where the urine contains neither. Now, although Ross[3] claims for indole-acetic acid an endogenous origin, it seems much more likely that its principal seat of formation is the intestine. It is, at any rate, a by no means uncommonly noted product of the bacterial decomposition of tryptophane;[4] and in the experiment with case 1 we observed a distinct increase (greater than could be conveniently indicated in the table) in the intensity of the urorosein reaction when tryptophane was added to a vegetable diet. There are, therefore, grounds for inferring that, whereas on a meat diet the intestinal bacteria (at least of the pellagrin) produce from tryptophane chiefly indole, on a vegetable diet the putrefaction of that amino-acid leads in large measure to indole-acetic acid. Further observations must decide whether this inference is entirely justified,

[1] It has been shown by Herter and Kendall (Journ. Biol. Chem., vii, p. 203, 1910) that the change from a dominantly protein to a carbohydrate-rich diet induces in cats and monkeys the "substitution of an acidophilic nonproteolyzing type of (intestinal) flora for a strongly proteolyzing type," and that the substitution is accompanied by a reduction in fecal indole and urinary indican.

[2] The effect of a vegetable diet in accentuating the "urorosein" reaction has already been remarked by Rosin (Deutsch. med. Wochenschr., xix, p. 519, 1893).

[3] Ross, Arch. Int. Med., xii, pp. 112 and 231, 1913.

[4] Hopkins and Cole, Journ. Physiol., xxix, p. 436, 1903.

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and whether, if it is, the contrast depends on a change in the bacterial species, or simply on a modification of their activity. In the meantime it is of interest to note that Herter [1] regarded indole-acetic acid as possibly a step in the production of skatole; and that Myers and Fine [2] found unusual quantities of skatole in the feces of some pellagrins.

It deserves to be pointed out, before leaving the subject, that a well-marked indicanuria shows a decided tendency to decline as the patient recovers from an acute attack of pellagra; so long, however, as the gastric HCl is subnormal and the diet mainly animal, the indican is unlikely to return quite to the normal level. These points are illustrated by cases 2 and 14.

NITROGEN BALANCES.

In order to gain further insight into the effect of the two types of diet employed in the hospital, we subjected seven of the patients to an experiment in which the balance of nitrogen was determined. Two of these patients were upon diet C, three were on diet B, one was at first upon B and later upon E, while the seventh was placed successively upon diets B, E, and A. The shortest experiment lasted 23 days, the longest 44. The urine was collected and analyzed in 24 hour periods, the day beginning and ending as a rule at 7 a. m. The feces were acidified with oxalic acid, dried on the water bath, and prepared for analysis by powdering and thorough mixing; the different periods were delimited by the use of carmine. All food materials supplied to the patients were weighed by, and prepared under the supervision of, a trained dietitian familiar with the technique of metabolism experiments. The nitrogen content of each item in the diet was determined by analysis either of the cooked dish, or of the raw material from which it was prepared. Articles like corn meal, rice, beans, evaporated milk, etc., were bought in bulk, and the exact nitrogen content of each lot once for all ascertained. The same procedure was adopted with potatoes, cabbages, turnips, and the like; but in this case the variations between individual samples of the same lot were so great that it was necessary to base our calculations on the average of a large number of not very concordant analyses. Meat was bought in large quantities, carefully separated from fat, ground, sampled, divided into weighed portions, and frozen until required. With eggs, we beat together whites and yolks enough to supply a number of patients, and analyzed the mixture; or, alternatively, we determined the nitrogen content, after scrambling, of a lot sufficient to last two days. Milk had to be analyzed daily. The bread, obtained always from the same bakery, was found

[1] Herter, Journ. Biol. Chem., iv, p. 101, 1908. [2] Myers and Fine, loc. cit.

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to show in successive batches such insignificant variations in nitrogen percentage that we ceased after a time to make more than an occasional analysis.[1]

Every endeavor was made to secure the quantitative consumption of all food offered to each patient; but the appetite of the majority was so capricious that we were only too often compelled to weigh back rejected portions of the ration. The slight errors unavoidably attaching to this procedure were certainly not of sufficient importance to seriously vitiate our results. We feel confident, too, that in all the experiments we publish the collection of the excreta was accomplished without appreciable loss. This was not done without dificulty, for not only were the subjects uninterested in the experiment, but, being pellagrins, they could seldom be relied on to remember, much less to follow, instructions. Several experiments had to be abandoned after a week or so, because the patient accidentally escaped from control; and only the constant vigilance of the nursing and laboratory staffs made it possible to bring to a successful conclusion those that are now reported.

In the tables showing the data of the several experiments we have not thought it necessary to record all the details of the daily food consumption; but by way of illustration we have done so for two days in each experiment, the days selected being those of maximum and minimum nitrogen intake. It seemed worth while also to calculate, for each of the three or four periods into which an experiment was divided, the *average* daily quantity, with its caloric value, of each food item eaten by the patient. Quantities of milk and of coffee are reported in cubic centimeters, those of other articles in grams. The urinary record under a given date applies to the specimen of which the collection ended at 7 a. m. on the following morning.

EXPERIMENT I.—*Case 2, diet C; weight, 57.1 kgms. on Sept. 21, 61.2 on Oct. 28.*

Food.	Examples of daily consumption.				Average consumption by periods.					
	Oct. 4.		Oct. 7.		Period 1.		Period 2.		Period 3.	
	Amount.	Nitrogen.	Amount.	Nitrogen.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.
Milk	1,000	5.67	1,000	4.50	1,000	735	1,000	735	1,000	735
Egg	100	2.16	100	2.00	99	151	100	153	100	153
Beef	120	4.32	120	4.31	120	144	120	144	120	144
Bread	200	2.66	200	2.66	200	576	200	576	200	576
Potato	200	.52	100	.27	145	122	120	101	110	93
Rice	.....	.....	30	.35	15	54	24	86	27	97
Orange juice	200	.30	200	.30	200	106	200	106	200	106
Jam	30	.06	30	.06	30	77	30	77	30	77
Butter	50	.04	50	.04	50	396	50	396	50	396
Sugar	40	.....	40	.....	40	164	40	164	40	164
Coffee	150	.05	150	.05	0	.....	0	.....	210	.....
Totals	.....	15.78	.....	14.54	.....	2,525	.....	2,538	.....	2,541

[1] For further details see the appendix to this paper.

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EXPERIMENT I.—*Case 2, diet C; weight 57.1 kgms. on Sept. 21, 61.2 on Oct. 28*—Continued.

Period.	Date.	Urine.				Feces.			Total output of nitrogen.	Nitrogen intake.	Nitrogen balance.	
		Volume.	Specific gravity.	Reaction.	Nitrogen.	Dry weight.	Nitrogen.				Daily.	Period.
		cc.			*Gms.*	*Gms.*	*Gms.*	*P. ct.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*
1	Sept. 12	1,005	1.022	Acid...	12.01	19.5	1.09	5.59	13.10	14.80	+1.70	
	13	880	24	...do...	11.54	19.5	1.09	5.59	12.63	14.81	+2.18	
	14	1,125	20	...do...	12.62	19.5	1.09	5.59	13.71	14.68	+ .97	
	15	680	26	...do...	10.71	19.5	1.09	5.59	11.80	15.15	+1.35	
	16	980	20	...do...	11.50	19.5	1.09	5.59	12.59	15.16	+2.57	
	17	970	21	...do...	11.48	19.5	1.09	5.59	12.57	15.43	+2.86	+27.52
	18	1,070	17	...do...	10.92	19.5	1.09	5.59	12.01	15.66	+3.65	
	19	1,005	19	...do...	10.95	19.5	1.09	5.59	12.04	15.59	+3.55	
	20	915	21	...do...	11.04	19.5	1.09	5.59	12.13	15.59	+3.46	
	21	965	20	...do...	11.99	19.5	1.09	5.59	13.08	15.49	+2.41	
	22	785	28	...do...	11.51	19.5	1.09	5.59	12.60	15.32	+2.72	
2	23	850	25	...do...	11.74	22.5	1.19	5.30	12.93	15.43	+2.50	
	24	1,280	21	...do...	11.98	22.5	1.19	5.30	13.17	15.37	+2.20	
	25	690	28	...do...	10.89	22.5	1.19	5.30	12.08	15.30	+3.22	
	26	815	24	...do...	11.78	22.5	1.19	5.30	12.97	15.54	+2.57	
	27	790	27	...do...	11.46	22.5	1.19	5.30	12.65	15.65	+3.00	+26.99
	28	900	24	...do...	11.58	22.5	1.19	5.30	12.77	15.70	+3.13	
	29	1,005	21	...do...	11.88	22.5	1.19	5.30	13.07	15.21	+2.14	
	30	740	28	...do...	11.47	22.5	1.19	5.30	12.66	15.28	+2.62	
	Oct. 1	710	30	...do...	11.52	22.5	1.19	5.30	12.71	15.75	+3.04	
	2	(?)	26	...do...	11.65	22.5	1.19	5.30	12.84	15.41	+2.57	
3	3	810	24	...do...	11.85	22.9	1.22	5.32	13.07	15.60	+2.53	
	4	810	27	...do...	11.94	22.9	1.22	5.32	13.16	15.78	+2.62	
	5	800	27	...do...	11.73	22.9	1.22	5.32	12.95	15.77	+2.82	
	6	1,050	19	...do...	11.65	22.9	1.22	5.32	12.87	14.77	+1.90	
	7	690	27	...do...	11.41	22.5	1.22	5.32	12.63	14.52	+1.89	+24.9
	8	805	23	...do...	11.76	22.9	1.22	5.32	12.98	14.94	+1.96	
	9	(?)	27	...do...	12.04	22.9	1.22	5.32	13.26	14.98	+1.72	
	10	700	25	...do...	10.70	22.9	1.22	5.32	11.92	15.12	+3.20	
	11	700	26	...do...	11.08	22.9	1.22	5.32	12.30	15.18	+2.88	
	12	810	22	...do...	10.43	22.9	1.22	5.32	11.65	15.11	+3.46	
Final balance												+79.49

EXPERIMENT II.—*Case 14, diet C; weight, 50.5 kgms. on Oct. 19.*

Food.	Examples of daily consumption.				Average consumption by periods.					
	Oct. 1.		Sept. 15.		Period 1.		Period 2.		Period 3.	
	Amount.	Nitrogen.	Amount.	Nitrogen.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.
Milk	1,000	5.60	1,000	5.45	1,000	735	1,000	735	1,000	735
Egg	100	2.16	90	1.89	99	151	100	153	100	153
Beef	120	4.32	70	2.46	115	138	120	144	120	144
Bread	200	2.66	200	2.68	200	576	200	576	200	576
Potato	100	.27	200	.48	164	138	120	101	110	93
Rice	30	.35	.....	.....	11	39	24	86	25	90
Orange juice	200	.30	200	.33	200	75	200	75	200	75
Jam	30	.06	30	.06	30	77	30	77	30	77
Butter	50	.04	50	.04	50	396	50	396	50	396
Sugar	40	.....	40	.....	40	164	40	164	40	164
Coffee	.....	.....	.....	.....	.....	.....	.....	.....	225	.....
Total	.....	15.76	.....	13.39	.....	2,489	.....	2,507	.....	2,503

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EXPERIMENT II.—*Case 14, diet C; weight, 50.5 kgms. on Oct. 19*—Continued.

Period.	Date.	Urine.				Feces.			Total output of nitrogen.	Nitrogen intake.	Nitrogen balance.	
		Volume.	Specific gravity.	Reaction.	Nitrogen.	Dry weight.	Nitrogen.				Daily.	Period.
		cc.			Gms.	Gms.	Gms.	P. ct.	Gms.	Gms.	Gms.	Gms.
1	Sept. 12	540	1.032	Acid...	8.74	31.6	1.74	5.48	10.48	14.80	+4.32	
	13	425	36	...do....	8.40	31.6	1.74	5.48	10.14	14.67	+4.53	
	14	450	37	...do....	8.64	31.6	1.74	5.48	10.38	14.68	+4.30	
	15	485	35	...do....	9.20	31.6	1.74	5.48	10.94	13.39	+2.45	
	16	400	36	...do....	7.90	31.6	1.74	5.48	9.64	15.16	+5.52	
	17	465	31	...do....	9.09	31.6	1.74	5.48	10.83	15.37	+4.54	+46.62
	18	500	31	...do....	8.31	31.6	1.74	5.48	10.05	15.66	+5.61	
	19	515	32	...do....	10.40	31.6	1.74	5.48	12.14	15.59	+3.45	
	20	550	32	...do....	9.96	31.6	1.74	5.48	11.70	15.59	+3.89	
	21	505	32	...do....	9.77	31.6	1.74	5.48	11.51	15.49	+3.98	
	22	420	32	...do....	9.55	31.6	1.74	5.48	11.29	15.32	+4.03	
2	23	620	31	...do....	9.60	37.9	2.08	5.48	11.68	15.43	+3.75	
	24	490	35	...do....	8.59	37.9	2.08	5.48	10.67	15.37	+4.70	
	25	560	34	...do....	10.04	37.9	2.08	5.48	12.12	15.29	+3.17	
	26	550	33	...do....	10.36	37.9	2.08	5.48	12.44	15.54	+3.10	
	27	595	34	...do....	10.45	37.9	2.08	5.48	12.53	15.65	+3.12	+33.37
	28	585	33	...do....	10.53	37.9	2.08	5.48	12.61	15.70	+3.09	
	29	575	33	...do....	10.40	37.9	2.08	5.48	12.48	15.21	+2.73	
	30	560	35	...do....	9.31	37.9	2.08	5.48	11.39	15.28	+3.39	
	Oct. 1	535	35	...do....	9.97	37.9	2.08	5.48	12.05	15.76	+3.71	
	2	575	35	...do....	10.72	37.9	2.08	5.48	12.80	15.41	+2.61	
3	3	510	33	...do....	10.07	30.9	1.70	5.51	11.77	15.60	+3.83	
	4	590	35	...do....	10.75	30.9	1.70	5.51	12.45	15.73	+3.28	
	5	560	37	...do....	9.35	30.9	1.70	5.51	11.05	15.72	+4.67	
	6	540	37	...do....	9.88	30.9	1.70	5.51	11.58	14.54	+2.96	
	7	585	34	...do....	10.16	30.9	1.70	5.51	11.86	14.32	+2.46	+38.66
	8	500	34	...do....	9.54	30.9	1.70	5.51	11.24	14.93	+3.69	
	9	550	34	...do....	9.54	30.9	1.70	5.51	11.24	14.98	+3.74	
	10	630	27	...do....	9.05	30.9	1.70	5.51	10.75	15.12	+4.37	
	11	560	32	...do....	7.78	30.9	1.70	5.51	9.48	15.18	+5.70	
	12	605	30	...do....	9.45	30.9	1.70	5.51	11.15	15.11	+3.96	
Final balance												+118.65

EXPERIMENT III.—*Case 1, diet B.*

Food.	Examples of daily consumption.				Average consumption by periods.							
	Oct. 16.		Oct. 19.		Period 1.		Period 2.		Period 3.		Period 4.	
	Amount.	Nitrogen.	Amount.	Nitrogen.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.
Corn meal	350	4.73	300	4.05	320	1,216	344	1,307	347	1,318	349	1,326
Grits	150	1.95	111	1.45	163	592	150	544	150	544	148	537
Cabbage	100	.19	100	.19	100	31	100	31	100	31	100	31
Turnip	100	.19	100	.19	100	40	100	40	100	40	100	40
Sweet potato	150	.35	150	.35	150	186	150	186	150	186	150	186
Prunes	30	.06	30	.06	30	78	30	78	30	78	30	78
Corn sirup	30	.....	30	.....	30	86	30	86	30	86	30	86
Compound lard	15	.....	15	.....	15	120	15	120	15	120	15	120
Oleomargarine											55	428
Sugar	20	.....	20	.....	20	82	20	82	20	82	20	82
Ham	25	1.33	25	1.33	24	60	25	62	25	62	25	62
Pork fat	50	.07	50	.07	50	402	100	803	50	402	50	402
Evaporated milk	33	.34	33	.34	33	49	33	49	33	49	29	43
Coffee	300	.10	300	.10	300	.....	300	.....	300	.....	300	.....
Total	.....	9.31	.....	8.13	.....	2,942	.....	3,388	.....	2,994	.....	3,421

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EXPERIMENT III.—*Case 1, diet B.*

Period.	Date.	Weight.	Urine.				Feces.			Total output of nitrogen.	Nitrogen intake.	Nitrogen balance.	
			Volume.	Specific gravity.	Reaction.	Nitrogen.	Dry weight.	Nitrogen.				Daily.	Period.
		Kgms.	*cc.*			*Gms.*	*Gms.*	*Gms.*	*P. ct.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*
1	Oct. 16	54.6	1,450	1.017	sl. ac..	4.96	38.3	1.41	3.67	6.37	9.31	+ 2.94	
	17	.....	1,070	23	...do..	5.06	38.3	1.41	3.67	6.47	9.29	+ 2.82	
	18	.....	665	20	acid...	3.61	38.3	1.41	3.67	5.02	9.01	+ 3.99	
	19	.....	625	24	...do..	3.70	38.3	1.41	3.67	5.11	8.13	+ 3.02	
	20	.....	1,060	22	...do..	4.56	38.3	1.41	3.67	5.97	9.12	+ 3.15	+29.53
	21	.....	1,250	20	sl. ac..	5.26	38.3	1.41	3.67	6.67	8.10	+ 1.43	
	22	.....	1,100	25	...do..	5.24	38.3	1.41	3.67	6.65	9.12	+ 2.47	
	23	.....	1,170	24	...do..	4.87	38.3	1.41	3.67	6.28	9.12	+ 2.84	
	24	.....	835	22	...do..	3.60	38.3	1.41	3.67	5.01	9.14	+ 4.13	
	25	.....	965	23	...do..	4.96	38.3	1.41	3.67	6.37	9.14	+ 2.77	
2	26	.....	945	24	acid...	4.40	51.3	2.15	4.18	6.55	9.21	+ 2.66	
	27	.....	1,310	21	sl. ac..	5.17	51.3	2.15	4.18	7.32	9.21	+ 1.89	
	28	.....	1,175	21	acid...	4.25	51.3	2.15	4.18	6.40	9.21	+ 2.81	
	29	55.0	1,280	22	amph.	4.52	51.3	2.15	4.18	6.67	9.21	+ 2.54	
	30	.....	1,630	17	acid...	4.87	51.3	2.15	4.18	7.02	9.21	+ 2.19	+23.15
	31	.....	1,250	22	alk....	4.56	51.3	2.15	4.18	6.71	9.21	+ 2.50	
	Nov. 1	.....	975	21	...do..	4.09	51.3	2.15	4.18	6.24	9.21	+ 2.97	
	2	.....	1,060	25	sl. ac..	4.92	51.3	2.15	4.18	7.07	9.21	+ 2.14	
	3	.....	620	30	acid...	3.61	51.3	2.15	4.18	5.76	9.21	+ 3.45	
3	4	.....	1,300	27	sl. ac..	6.18	51.7	1.96	3.79	8.14	9.14	+ 1.00	
	5	.....	1,180	25	...do..	6.02	51.7	1.96	3.79	7.98	8.40	+ .42	
	6	56.4	900	26	acid...	7.42	51.7	1.96	3.79	9.38	8.83	− .55	
	7	.....	350	30	...do..	3.96	51.7	1.96	3.79	5.92	8.83	+ 2.91	
	8	.....	550	30	...do..	3.86	51.7	1.96	3.79	5.82	8.83	+ 3.01	
	9	.....	1,750	22	...do..	7.85	51.7	1.96	3.79	9.81	8.83	− .98	
	10	.....	1,350	17	...do..	5.17	51.7	1.96	3.79	7.13	8.83	+ 1.70	+20.03
	11	56.6	1,080	18	...do..	4.48	51.7	1.96	3.79	6.44	8.83	+ 2.39	
	12	.....	940	21	...do..	4.06	51.7	1.96	3.79	6.02	8.83	+ 2.87	
	13	.....	1,070	16	...do..	5.68	51.7	1.96	3.79	7.64	8.83	+ 1.19	
	14	.....	2,150	16	sl. ac..	4.18	61.8	2.25	3.54	6.43	8.83	+ 2.40	
	15	.....	1,060	21	acid...	5.01	61.8	2.25	3.54	7.26	8.83	+ 1.57	
	16	.....	800	21	...do..	4.05	61.8	2.25	3.54	6.30	8.40	+ 2.10	
4	17	.....	2,105	16	...do..	6.57	31.0	1.80	5.81	8.37	[1] 8.51	+ .14	
	18	.....	1,560	16	sl. ac..	5.10	31.0	1.80	5.81	6.90	[1] 8.52	+ 1.62	
	19	57.4	1,000	23	amph.	4.50	31.0	1.80	5.81	6.30	[2] 8.59	+ 2.29	
	20	.....	1,340	19	sl. ac..	4.80	34.6	2.09	6.06	6.89	8.45	+ 1.56	
	21	.....	1,145	22	amph.	4.80	34.6	2.09	6.06	6.89	8.57	+ 1.68	
	22	.....	1,150	22	...do..	5.04	34.6	2.09	6.06	7.13	8.57	+ 1.44	[5] +45.23
	23	.....	1,170	28	sl. ac..	5.94	37.7	2.38	6.34	8.32	[3] 16.39	+ 8.07	
	24	.....	1,555	21	...do..	9.17	37.7	2.38	6.34	11.55	[4] 24.22	+12.67	
	25	.....	1,255	25	...do..	10.01	37.7	2.38	6.34	12.39	[4] 23.69	+11.30	
	26	59.6	1,150	21	...do..	6.81	21.4	1.48	6.92	8.29	8.57	+ .28	
	27	.....	1,100	26	...do..	5.15	21.4	1.48	6.92	6.63	8.57	+ 1.94	
	28	.....	1,200	25	alk....	4.85	21.4	1.48	6.92	6.33	8.57	+ 2.24	
Final balance													+117.94
Balance, omitting Nov. 23, 24, and 25													+ 85.90

[1] Includes 0.068 gms. N. in tryptophane.
[2] Includes 0.137 gms. N. in tryptophane.
[3] Includes 7.82 gms. casein N.
[4] Includes 15.65 gms. casein N.
[5] If no casein had been fed on Nov. 23-25, the total gain of this period, as calculated from the average gain of its other days, would have been only 17.60 gms.

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EXPERIMENT IV.—*Case 19, diet B.*

Food.	Examples of daily consumption.				Average consumption by periods.					
	Nov. 4.		Nov. 13.		Period 1.		Period 2.		Period 3.	
	Amount.	Nitrogen.	Amount.	Nitrogen.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.
Corn meal	350	4.73	253	3.28	330	1,254	300	1,140	333	1,266
Grits	150	1.96	27	.35	124	450	105	381	1	4
Cabbage	100	.19	100	.19	100	31	100	31	100	31
Turnip	100	.19	100	.19	100	40	100	40	100	40
Sweet potato	150	.35	150	.35	150	186	150	186	150	186
Prunes	30	.06	30	.06	30	78	27	70	30	78
Corn sirup	30	.....	5	.....	28	80	13	37	.....	.....
Compound lard	15	.....	10	.....	14	112	13	104	14	112
Oleomargarine	.....	.....	.....	.....	.....	.....	36	280	60	466
Sugar	20	.....	20	.....	20	82	19	78	18	74
Ham	25	1.18	25	1.06	25	62	25	62	25	62
Pork fat	50	.07	50	.07	50	402	80	642	50	402
Evaporated milk	33	.34	15	.15	31	46	30	44	33	49
Coffee	300	.10	300	.10	305	.....	300	.....	300	.....
Total	.....	9.17	.....	5.80	.....	2,823	.....	3,095	.....	2,770

Period.	Date.	Weight.	Urine.				Feces.			Total output of nitrogen.	Nitrogen intake.	Nitrogen balance.	
			Volume.	Specific gravity.	Reaction.	Nitrogen.	Dry weight.	Nitrogen.				Daily.	Period.
		Kgms.	cc.			*Gms.*	*Gms.*	*Gms.*	*P. ct.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*
1	Nov. 4	.....	4,460	1.010	Acid...	4.54	57.9	2.74	4.73	7.28	9.17	+1.89	
	5	.....	5,156	10	Sl. ac...	4.54	57.9	2.74	4.73	7.28	9.05	+1.77	
	6	46.3	4,065	08	...do...	3.67	57.9	2.74	4.73	6.41	9.03	+2.62	
	7	.....	3,805	09	...do...	4.57	57.9	2.74	4.73	7.31	7.35	+ .04	
	8	.....	3,350	09	Acid...	4.50	57.9	2.74	4.73	7.24	8.84	+1.60	+11.48
	9	.....	4,075	08	...do...	4.88	57.9	2.74	4.73	7.62	8.84	+1.22	
	10	.....	3,690	10	...do...	4.69	57.9	2.74	4.73	7.43	8.84	+1.41	
	11	.....	3,820	06	Sl. ac...	3.48	57.9	2.74	4.73	6.22	8.84	+2.62	
	12	.....	5,100	07	...do...	5.18	57.9	2.74	4.73	7.92	7.21	− .71	
	13	.....	4,250	06	...do...	4.04	57.9	2.74	4.73	6.78	5.80	− .98	
2	14	.....	3,160	09	...do...	4.04	60.7	2.92	4.81	6.96	6.60	− .36	
	15	.....	4,365	06	...do...	4.41	60.7	2.92	4.81	7.33	7.76	+ .43	
	16	.....	4,750	06	...do...	4.41	60.7	2.92	4.81	7.33	7.75	+ .42	
	17	.....	6,325	07	...do...	4.27	60.7	2.92	4.81	7.19	8.91	+1.72	
	18	.....	4,015	08	...do...	4.00	60.7	2.92	4.81	6.92	7.74	+ .82	+ 7.31
	19	45.9	4,420	08	...do...	4.49	60.7	2.92	4.81	7.41	9.11	+1.70	
	20	.....	5,130	06	...do...	4.54	60.7	2.92	4.81	7.46	9.11	+1.65	
	21	.....	3,985	09	...do...	4.49	60.7	2.92	4.81	7.41	7.88	+ .47	
	22	.....	3,420	10	...do...	4.17	60.7	2.92	4.81	7.09	7.55	+ .46	
	23	.....	3,980	08	...do...	4.19	60.7	2.92	4.81	7.11	7.11	+ .00	
3	24	.....	4,640	08	...do...	4.41	50.6	2.51	4.97	6.92	6.74	− .18	
	25	.....	3,955	08	...do...	4.38	50.6	2.51	4.97	6.89	7.04	+ .15	
	26	46.2	4,890	07	...do...	4.51	50.6	2.51	4.97	7.02	6.60	− .42	
	27	.....	4,040	07	...do...	3.22	50.6	2.51	4.97	5.73	6.79	+1.06	
	28	.....	4,400	09	...do...	4.13	50.6	2.51	4.97	6.64	7.15	+ .51	+ 3.58
	29	.....	3,220	08	...do...	3.26	50.6	2.51	4.97	5.77	6.97	+1.20	
	30	.....	4,460	08	Alk....	3.88	50.6	2.51	4.97	6.39	6.93	+ .54	
	Dec. 1	.....	4,430	07	...do...	3.65	50.6	2.51	4.97	6.16	7.01	+ .85	
	2	47.0	5,780	07	...do...	3.92	50.6	2.51	4.97	6.43	6.80	+ .37	
	3	.....	7,200	04	...do...	4.11	50.6	2.51	4.97	6.62	6.12	− .50	
	Final balance	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	+22.37

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EXPERIMENT V.—*Case 36, diet B.*

Food.	Examples of daily consumption.				Average consumption by periods.					
	Oct. 26.		Nov. 15.		Period 1.		Period 2.		Period 3.	
	Amount.	Nitrogen.	Amount.	Nitrogen.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.
Corn meal	350	4.73	.....	.....	299	1,136	263	1,000	142	540
Grits	189	2.46	6	0.08	166	603	96	348	40	145
Cabbage	100	.19	.....	.....	92	29	77	24	75	23
Turnip	100	.19	33	.06	91	26	75	30	51	20
Sweet potato	150	.35	30	.07	150	186	150	186	137	170
Prunes	30	.06	30	.06	30	78	29	76	30	78
Corn sirup	30	.....	13	.....	30	86	30	86	27	78
Compound lard	15	.....	.....	.....	14	112	11	88	9	72
Sugar	20	.....	12	.....	20	82	20	82	19	78
Ham	25	1.18	18	.76	25	62	25	62	22	57
Pork fat	50	.07	.....	.....	48	385	50	402	44	353
Evaporated milk	33	.33	12	.12	33	49	33	49	22	32
Coffee	300	.10	175	.06	300	.....	300	.....	298	.....
Total	.....	9.66	.....	1.21	.....	2,844	.....	2,433	.....	1,646

Period.	Date.	Weight.	Urine.				Feces.			Total output of nitrogen.	Nitrogen intake.	Nitrogen balance.	
			Volume.	Specific gravity.	Reaction.	Nitrogen.	Dry weight.	Nitrogen.				Daily.	Period.
		Kgms.	*cc.*			*Gms.*	*Gms.*	*Gms.*	*P.ct.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*
1	Oct. 17	.....	840	1.025	Acid...	5.27	45.0	1.97	4.38	7.24	9.29	+2.05	
	18	.....	670	27	...do....	5.09	45.0	1.97	4.38	7.06	9.26	+2.20	
	19	.....	840	29	...do....	6.49	45.0	1.97	4.38	8.46	9.26	+ .80	
	20	.....	855	31	...do....	7.09	45.0	1.97	4.38	9.06	9.26	+ .20	+ 4.36
	21	67.5	870	31	...do....	7.39	45.0	1.97	4.38	9.36	9.11	− .25	
	22	.....	1,020	29	...do....	6.56	45.0	1.97	4.38	8.53	9.11	+ .58	
	23	.....	1,150	26	...do....	6.89	45.0	1.97	4.38	8.86	7.81	−1.05	
	24	.....	750	25	...do....	4.58	45.0	1.97	4.38	6.55	6.38	− .17	
2	25	.....	750	26	...do....	5.50	43.0	1.98	4.60	7.48	6.66	− .82	
	26	.....	570	30	...do....	4.31	43.0	1.98	4.60	6.29	9.66	+3.37	
	27	.....	760	27	...do....	4.80	43.0	1.98	4.60	6.78	4.77	−2.01	+ 2.86
	28	63.3	460	30	...do....	4.10	43.0	1.98	4.60	6.08	5.98	− .10	
	29	.....	500	28	...do....	4.36	43.0	1.98	4.60	6.34	8.77	+2.43	
3	Nov. 6[1]	.....	650	27	...do....	5.04	33.5	1.68	5.02	6.72	6.10	− .62	
	7	.....	760	26	...do....	5.28	33.5	1.68	5.02	6.96	6.26	− .70	
	8	.....	770	26	...do....	4.97	33.5	1.68	5.02	6.65	6.36	− .29	
	9	.....	810	24	...do....	5.20	33.5	1.68	5.02	6.88	4.85	−2.03	
	10	.....	700	26	...do....	5.04	33.5	1.68	5.02	6.72	5.44	−1.28	−21.93
	11	64.4	725	25	...do....	5.19	33.5	1.68	5.02	6.87	4.58	−2.29	
	12	.....	680	24	...do....	5.12	33.5	1.68	5.02	6.80	4.31	−2.49	
	13	.....	510	24	...do....	4.46	33.5	1.68	5.02	6.14	2.98	−3.16	
	14	.....	430	27	...do....	4.49	33.5	1.68	5.02	6.17	1.46	−4.71	
	15	.....	260	28	...do....	3.89	33.5	1.68	5.02	5.57	1.21	−4.36	
Final balance		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	−14.71

[1] From Oct. 30 to Nov. 2, inclusive, the patient absented himself from the hospital.

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EXPERIMENT VI.—*Case 46; diet, for the first period, B; for second and third, E slightly modified.*

Food.	Examples of daily consumption.				Average consumption by periods.					
	Oct. 28.		Oct. 22.		Period 1.		Period 2.		Period 3.	
	Amount.	Nitrogen.	Amount.	Nitrogen.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.
Corn meal	.....	.....	112	1.51	136	517	.....	.....	.....	.....
Grits	.....	.....	75	.98	143	519	.....	.....	.....	.....
Cabbage	100	0.19	100	.19	100	31	100	31	90	28
Turnip	100	.19	100	.19	100	40	100	40	90	36
Sweet potato	.....	.....	150	.35	92	114	50	62	60	74
Prunes	30	.06	30	.06	30	78	30	78	30	78
Corn sirup	30	.....	30	.....	30	86	34	98	42	121
Compound lard	.....	.....	6	.....	7	56	.....	.....	.....	.....
Sugar	10	.....	10	.....	10	41	11	45	19	78
Ham	.....	.....	25	1.18	25	62	.....	.....	.....	.....
Pork fat	50	.07	50	.07	50	402	50	402	50	402
Evaporated milk	33	.33	13	.13	18	26	33	49	33	49
Shredded wheat	27	.50	.....	.....	.....	.....	31	116	25	94
Bread	250	3.33	.....	.....	.....	.....	250	720	250	720
Peanut butter	40	1.88	.....	.....	.....	.....	40	234	40	234
Potato	100	.27	.....	.....	.....	.....	50	42	40	34
Beans	50	1.65	.....	.....	.....	.....	40	143	50	179
Coffee	300	.10	150	.05	150	.....	225	.....	300	.....
Total	.....	8.57	.....	4.71	.....	1,972	.....	2,060	.....	2,127

Period.	Date.	Weight.	Urine.				Feces.			Total output of nitrogen.	Nitrogen intake.	Nitrogen balance.	
			Volume.	Specific gravity.	Reaction.	Nitrogen.	Dry weight.	Nitrogen.				Daily.	Period.
		Kgms.	*cc.*			*Gms.*	*Gms.*	*Gms.*	*P. ct.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*
1	Oct. 16	.....	1,200	1.015	sl. ac...	5.00	26.5	1.30	4.91	6.30	7.22	+0.92	
	17	.....	1,200	16	...do...	4.58	26.5	1.30	4.91	5.88	6.84	+ .96	
	18	50.3	1,200	17	...do...	4.57	26.5	1.30	4.91	5.87	6.18	+ .31	
	19	.....	555	24	acid...	4.90	26.5	1.30	4.91	5.22	5.85	+ .63	— 1.19
	20	.....	560	30	...do...	4.90	26.5	1.30	4.91	6.20	5.31	— .89	
	21	.....	950	21	...do...	5.22	26.5	1.30	4.91	6.52	5.19	−1.33	
	22	.....	725	28	sl. ac...	5.20	26.5	1.30	4.91	6.50	4.71	−1.79	
2	23	.....	1,480	14	...do...	5.52	21.9	1.29	5.91	6.81	7.79	+ .98	
	24	.....	515	30	acid...	4.58	21.9	1.29	5.91	5.87	8.43	+2.56	
	25	.....	540	27	...do...	5.31	21.9	1.29	5.91	6.30	8.52	+2.22	
	26	.....	535	30	...do...	5.82	21.9	1.29	5.91	7.11	8.47	+1.36	
	27	.....	1,020	21	...do...	6.77	21.9	1.29	5.91	8.06	8.43	+ .37	+13.78
	28	48.5	680	24	...do...	5.60	21.9	1.29	5.91	6.89	8.57	+1.68	
	29	.....	750	25	...do...	5.91	21.9	1.29	5.91	7.20	8.47	+1.27	
	30	.....	720	23	...do...	5.35	21.9	1.29	5.91	6.64	8.54	+1.90	
	31	.....	745	23	...do...	5.82	21.9	1.29	5.91	7.11	8.48	+1.37	
	Nov. 1	.....	920	20	...do...	5.98	21.9	1.29	5.91	7.27	7.34	+ .07	
3	2	.....	730	23	...do...	5.72	27.9	1.67	5.99	7.39	8.48	+1.09	
	3	.....	540	32	...do...	6.18	27.9	1.67	5.99	7.85	8.53	+ .68	
	4	.....	930	21	...do...	6.90	27.9	1.67	5.99	8.57	8.49	— .08	
	5	48.5	460	29	...do...	4.78	27.9	1.67	5.99	6.45	8.53	+2.08	
	6	.....	685	23	...do...	5.86	27.9	1.67	5.99	7.53	8.49	+ .96	+ 9.05
	7	.....	770	19	...do...	5.98	27.9	1.67	5.99	7.65	8.49	+ .84	
	8	.....	505	26	...do...	5.20	27.9	1.67	5.99	6.87	8.53	+1.66	
	9	.....	500	32	...do...	6.55	27.9	1.67	5.99	8.22	8.49	+ .27	
	10	.....	420	30	...do...	6.16	27.9	1.67	5.99	7.83	8.53	+ .70	
	11	49.1	630	24	...do...	5.97	27.9	1.67	5.99	7.64	8.49	+ .85	
Final balance		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	+21.64

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EXPERIMENT VII.—*Case 32; diet, for first period, B; for second, E; for third, A.*

Food.	Examples of daily consumption.				Average consumption by periods.					
	Nov. 28.		Nov. 16.		Period 1.		Period 2.		Period 3.	
	Amount.	Nitrogen.	Amount.	Nitrogen.	Amount.	Calories.	Amount.	Calories.	Amount.	Calories.
Corn meal	.....	.....	17	0.22	134	509	45	171	.....	.....
Grits	.....	.....	5	.065	16	58	8	29	.....	.....
Cabbage	.....	.....	13	.025	18	6	1	.....	.....	.....
Turnip	.....	.....	36	.068	48	19	23	9	.....	.....
Sweet potato	.....	.....	114	.262	82	102	27	33	.....	.....
Prunes	.....	.....	30	.057	5	13	5	13	.....	.....
Corn sirup	.....	.....	.....	.....	8	23	.....	.....	.....	.....
Compound lard	.....	.....	.....	.....	7	56	2	16	.....	.....
Oleomargarine	.....	.....	.....	.....	1	8	39	303	.....	.....
Sugar	20	.....	20	.....	20	82	20	82	16	66
Ham	.....	.....	18	.679	12	30	6	15	.....	.....
Pork fat	.....	.....	.....	.....	17	137	31	249	.....	.....
Evaporated milk	.....	.....	20	.224	20	29	27	40	.....	.....
Bread	200	2.66	.....	.....	.....	.....	133	383	172	495
Egg	100	2.21	.....	.....	.....	.....	.....	.....	83	127
Beef	178	6.27	.....	.....	.....	.....	.....	.....	113	136
Butter	40	.03	.....	.....	.....	.....	.....	.....	25	198
Potato	200	.54	.....	.....	.....	.....	.....	.....	168	141
Jam	22	.05	.....	.....	.....	.....	.....	.....	14	36
Orange juice	100	.15	.....	.....	.....	.....	.....	.....	43	16
Total	.....	11.91	.....	1.60	.....	1,072	.....	1,344	.....	1,215

Period.	Date.	Weight.	Urine.				Feces.			Total output of nitrogen.	Nitrogen intake.	Nitrogen balance.	
			Volume.	Specific gravity.	Reaction.	Nitrogen.	Dry weight.	Nitrogen.				Daily.	Period.
		Kgms.	cc.			*Gms.*	*Gms.*	*Gms.*	*P. ct.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*
1	Nov. 12	57.5	950	1.009	alk.	3.15	21.3	0.97	4.54	4.12	3.28	−0.84	
	13	.....	550	12	...do...	2.36	21.3	.97	4.54	3.33	3.23	− .10	
	14	.....	1,140	11	...do...	3.56	21.3	.97	4.54	4.53	3.85	− .68	
	15	.....	770	11	...do...	3.12	21.3	.97	4.54	4.09	1.67	−2.42	−7.75
	16	.....	1,050	09	...do...	3.65	21.3	.97	4.54	4.62	1.60	−3.02	
	17	.....	1,020	11	...do...	3.29	21.3	.97	4.54	4.26	3.45	− .81	
	18	.....	1,000	09	amph..	2.47	21.3	.97	4.54	3.44	3.57	+ .12	
2	19	56.4	475	17	...do...	2.62	11.4	.71	6.24	3.33	4.23	+ .90	
	20	.....	790	13	sl. ac...	3.00	11.4	.71	6.24	3.71	3.21	− .50	
	21	.....	805	13	...do...	2.63	11.4	.71	6.24	3.34	3.76	− .42	
	22	.....	950	13	alk.	2.62	11.4	.71	6.24	3.33	3.52	+ .19	
	23	.....	940	12	...do...	3.27	11.4	.71	6.24	3.98	2.91	−1.07	−4.76
	24	.....	1,285	10	...do...	2.71	11.4	.71	6.24	3.42	3.59	+ .17	
	25	.....	1,070	11	...do...	3.16	11.4	.71	6.24	3.87	2.51	−1.36	
	26	56.2	1,015	09	...do...	3.06	11.4	.71	6.24	3.77	1.94	−1.83	
	27	.....	1,225	08	...do...	3.44	11.4	.71	6.24	4.15	3.31	− .84	
3	28	.....	1,090	13	...do...	5.24	27.6	1.09	3.38	6.33	11.91	+5.58	
	29	.....	1,580	11	amph..	5.70	27.6	1.09	3.38	6.79	7.51	+ .72	
	30	.....	400	26	acid....	4.98	27.6	1.09	3.38	6.07	10.27	+4.20	
	Dec. 1	.....	1,370	10	amph..	6.52	27.6	1.09	3.38	7.61	6.81	− .90	+13.49
	2	55.4	1,180	11	alk.	5.68	27.6	1.09	3.38	6.77	7.48	+ .71	
	3	.....	1,130	07	acid....	5.10	27.6	1.09	3.38	6.19	6.68	+ .49	
	4	.....	1,250	10	...do...	6.55	27.6	1.09	3.38	7.64	10.33	+2.69	
	Final balance	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	+.98

Remarks on the balance experiments.—EXPERIMENTS I AND II.—The subjects of these experiments took their food with great regularity, and the occasions on which a portion was rejected were comparatively few. The nitrogen balance in each was uniformly positive and resulted in a total retention in 31 days of 79.5 gms. by case 2 and 118.65 by case 14. These figures correspond to an

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average daily retention of 2.57 and 3.83 gms., respectively. In terms of protein case 2 gained 496 gms., case 14, 742 gms. The body weight was unfortunately not recorded during the experiments, but in the month following, during which the diet remained the same, it increased by 5.2 kgms. for case 2 and 3.9 kgms. for case 14. The retention of nitrogen and increase of weight were associated with a great improvement in general well-being and a gradual subsidence of the specific manifestations of pellagra. It may be concluded that a diet providing 2,500 calories and containing 15 gms. of nitrogen (of which 11 are in the form of animal protein) is not only likely to promote the recovery of the pellagrin from an acute attack, but is adequate to meet all the requirements, for maintenance and repair, of his convalescence.

It will be seen that in most respects the two cases exhibited a pretty close parallel. The only noteworthy difference was in the character of the feces. In 14 these were softer and bulkier and contained more solid material and more nitrogen than in the other. They were also much more offensive, in which connection it may be recalled that case 14 is the one which excreted by far the greatest amount of indican. So far as the fecal nitrogen is a criterion, protein utilization was rather less complete in case 14 than in case 2, its coefficient being about 89 in the former, 93 in the latter. The *percentage* of nitrogen in the feces was about the same in each case.

EXPERIMENT III.—This was the longest experiment of the series and one of the most successful. The patient remained on diet B for a period of 17 weeks, during 44 days of which the income and output of nitrogen were determined. Her appetite remained remarkably constant, and the fluctuations of the intake were comparatively small. The experiment affords, therefore, an excellent opportunity of comparing the effect of diet B in its entirety with that of diet C.

The urine has a lower nitrogen content and a less pronounced acidity than in the first two experiments. The feces, at least for the first three periods, are greater in quantity and relatively poorer in nitrogen. These differences are readily accounted for by the predominantly vegetable character and the low protein content of the diet. It is also in accord with reasonable anticipation that the coefficient of protein utilization is comparatively low, ranging in the different periods from 76 to 85, with a decided bias toward the lower figure.

The balance of nitrogen remained positive throughout. It was most decidedly so in the earlier days. The average daily gain of nitrogen was 2.95 gms. in the first period, 2.57 in the second, and 1.54 in the third.[1] The total gain of these periods, which included 32 days and afford, therefore, a fair basis of comparison with the experiments on diet C, was 72.7 gms., a grand average of 2.27 gms. per day. These

[1] The fourth period for obvious reasons can not be compared with the others.

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are practically the same figures as were yielded by experiment I, where the protein intake was 50 per cent greater. This favorable outcome of the balance, in spite of small intake and defective utilization, is doubtless to be attributed to the very high caloric value of the diet. Had it contained more protein, retention of nitrogen would have taken place even more rapidly than it did. This is demonstrated by the casein experiment in period 4. It will be seen that, of the 7.82 gms. casein nitrogen added to the diet on November 23, well over 6 gms. must, on the lowest computation, have been retained in the body, while of the 15.65 gms. added on the two days following, about 10 gms. were added to the positive balance on each occasion.[1] It would almost appear that, although diet B was liberal enough to maintain a steady increase of body protein (amounting, when the casein effect is included, to 736 gms. in 44 days), the gain resulting was hardly as rapid as the patient's nutritional state actually demanded. If that is true, the patient must have been suffering from a kind of specific nitrogen hunger, for in bodily appearance she was at the end of the experiment plump and well-nourished and had added 5 kgms. to her weight. Whether the diet had any influence on the subject's pellagra, it is impossible to state. The case was a mild and chronic one, the symptoms of which were chiefly mental. No definite improvement could be vouched for.

In periods 2 and 4 an attempt was made to test the effect of increasing the amount of fat in the diet. In period 2 this was done by

[1] We were not a little surprised by these results, which were certainly calculated to raise the suspicion that, despite all precautions, we were somehow failing to recover the whole of the patient's urine. So long as such a suspicion existed, the value of the whole experiment remained in very grave doubt. We decided, therefore, to test the point by determining how much of a dose of urea added to the diet could be actually recovered. The result of this experiment is exhibited below.

Date.	Urine.				Nitrogen intake.
	Volume.	Specific gravity.	Reaction.	Nitrogen.	
	cc.			*gms.*	*gms.*
Dec. 1	1,170	1.029	alk.....	4.27	7.17
2	980	30	...do....	4.08	7.91
3	960	30	...do....	4.24	5.90
4	1,070	29	...do....	11.78	[1] 17.61
5	1,100	29	...do....	6.10	6.50
6	780	31	...do....	4.17	6.88
7	868	28	...do....	4.12	6.85

[1] Of which 10 gms. was given in the form of 21.43 gms. urea.

It is unfortunate that the patient's appetite during this week fell away from its former regularity. The fluctuations of the food nitrogen were, however, without effect upon the urinary output. This averaged for the first three days 4.20, for the last two 4.15, for all five 4.18. Taking this as a basis, one may calculate that the urine of Dec. 4 and 5 contained 9.52 gms. extra nitrogen. This would mean a recovery of 95 per cent of the urea ingested. We take it as proved that very little of the patient's urine, if any, can have been lost on this occasion. Our confidence in the general correctness of our data is further strengthened by the fact that on two days of the main experiment (Nov. 13 and 14) the patient was not permitted for an instant to escape the observation of specially instructed nurses and that the urine of these days contained no more than the usual quantity of nitrogen.

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doubling the allowance of pork fat, the average intake of calories being thereby raised from 2,942 to 3,388. This appears to have resulted in an acceleration of the rate of increase of body weight, but a comparison of the urine and feces with those of the periods preceding and following does not reveal any certain effect of any kind upon nitrogen metabolism. In period 4 the extra fat took the form of oleomargarine, sufficient in quantity to raise the heat value of the food by about the same extent as before. Once again the increase of weight received an apparent stimulus. But, further, there is a change in the character of the feces. These contain about the same absolute amount of nitrogen as before, but their dry weight is greatly diminished and their percentage content of nitrogen correspondingly increased. These effects are not to be attributed to the casein experiment, since they were manifested much earlier in the period. Whether they have any real relation to the administration of oleomargarine, and, if they have, what is the casual connection, are questions that must at present be left unanswered. The increase of fat had no effect upon the pellagrous symptoms.

EXPERIMENT IV.—The results of this experiment were in general the same as those of the preceding one. There is the same bulkiness of the feces. Their nitrogen content is a little higher, though not so high as on diet C. Protein utilization is even poorer, only 60 to 67 per cent. The patient, moreover, did not consume her ration with the same regularity as case 1, so that her protein intake was frequently much below the standard for diet B. Accordingly her nitrogen gains were smaller, and, indeed, there are occasional days when the nitrogen balance is on the negative side. The patient made but a slight gain in weight and added only 140 gms. to her body protein. A comparison of periods 1 and 3 would indicate that with a caloric supply of 2,800 she was able, when the nitrogen intake was in the neighborhood of 9 gms., to retain from 1 to 2 gms. daily, but on an intake of only 7 gms. could do little more than maintain equilibrium.

In period 2 of this experiment the diet was enriched by the addition, on the average, of 30 gms. of pork fat and 36 of oleomargarine. This was without appreciable effect, unless the slight gain of weight between November 19 and 26 is to be attributed to this factor. The food of period 3 contained 60 gms. of extra fat entirely in the form of oleomargarine. There is a certain diminution perceptible in the weight of feces, but it is less marked than in the fourth period of Experiment III, and it is not accompanied by any rise in nitrogen percentage. This makes it very doubtful whether oleomargarine had anything to do with the changes that were noted in the earlier experiment, especially as the smaller bulk of feces in the present case

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may be readily explained as a result of the falling off in the consumption of other foods that unfortunately accompanied the increase of fat.

The diet in Experiment IV was without notable influence on the progress of the disease. The case, like case 1, was a very mild one. It will be observed that it was complicated by polyuria.

EXPERIMENT V.—This experiment is an excellent illustration of the occasional course of events when diet B is fed to a patient in the acute phase of pellagra. The patient at the beginning was in much the same physical condition as patient 2 (Experiment I). At first he relished his food and ate it with excellent appetite. During this stage the experiment followed a course not unlike that of Experiment IV, with a nitrogen balance which on the whole was positive; during periods 1 and 2 the daily gain averaged a little over half a gram. During the second period, however, the appetite began to be capricious, and on three out of five days the nitrogen balance was negative. In the third period—really a separate experiment following a short absence from hospital—the loss of appetite became steadily more pronounced, until the food intake reached the vanishing point. The feces diminished in amount and became richer in nitrogen. The balance became increasingly negative. In 10 days 22 gms. of nitrogen were lost to the body. On the 16th of November diarrhea supervened, and the patient was placed upon a meat diet. Subsequently he recovered completely.

EXPERIMENT VI.—Patient 46, who exhibited pellagra in a comparatively mild form, was placed at first upon diet B. His consumption of this diet was very unsatisfactory and resulted, as will be seen, in a nitrogen balance which speedily became negative. Accordingly the diet was changed by the substitution of wheat for corn and by the addition of peanut butter, Irish potatoes, and beans. On this régime the nitrogen intake became practically constant at about 8.5 gms. This was sufficient to maintain a positive balance such that in 20 days 22.83 gms. of nitrogen were retained and the falling body weight began to rise again. Considering that the intake of energy was little over 2,000 calories this may be regarded as a very satisfactory result. Protein utilization on the modified diet was 81 per cent. The urine was acid. The feces were not bulky, and contained even more nitrogen per cent than those of diet C (experiments I and II).

EXPERIMENT VII.—Patient 32, the subject of this experiment, had pellagra in a rather acute, though not very severe, form. She was placed at first on diet B. On this she appeared to be following the same course as case 36 in experiment V. Accordingly, after a week, during which she lost 7.75 gms. nitrogen, she was transferred to diet E. The quantity of this which she ate was still inadequate, and the

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loss of nitrogen continued almost without interruption. Considering the small intake not only of protein but of energy, it is surprising that the loss was no greater than it turned out to be. Surprising also are, firstly, the small quantity of feces excreted on the vegetable diets, and, secondly, the remarkably low figures for urinary nitrogen.[1] These last might have been understood if the diet had been one abundant in carbohydrate and fat; but with an energy income so meager as this patient's, urinary outputs of 2.36, 2.47, or 2.62 gms. of nitrogen are certainly remarkable. We had no opportunity of following this peculiarity further, for the patient was placed upon another diet. In period 3 the diet was therefore altered to A. Immediately the intake of protein increased, and nitrogen loss was converted into nitrogen gain. Had the patient's appetite been at all satisfactory, it is not to be doubted that the gain would have been continuous and rapid. As it was, although the food consumed had an average caloric value of only 1,215 and an average nitrogen content of only 8.7 gms., the patient retained in one week 13.49 gms., and ended with a final balance of +0.98. The experiment terminated with the patient's departure from hospital. It is therefore impossible to say whether the improvement in the nitrogen balance would have been followed by a mitigation of her symptoms.

In concluding this report we desire to place on record our hearty appreciation of the cooperation of each member of the hospital staff. We are especially indebted to Miss M. Maude Fauquier, head nurse and dietitian, whose skill and patience were indispensable to the success of the metabolism experiments, and to Dr. W. F. Tanner, assistant surgeon, United States Public Health Service, who rendered us invaluable assistance on the clinical side. The tryptophane was prepared by Dr. Menge, of the division of pharmacology, Hygienic Laboratory.

[1] This patient, who was one of the most intelligent of our series, assured us repeatedly that we were obtaining every drop of urine secreted, and we were unable to detect her in any lapse on this score.

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APPENDIX.

Nitrogen content expressed in percentage of the various articles used in the foregoing dietaries:

Beans, navy (raw, air dry)..... 3.29
Beef juice (from meat press), 1.99, 1.96..... 1.975
Brain, ox..... 1.81
Bread, white loaf wheat, 1.37, 1.35, 1.31, 1.32..... 1.83
Bread, cooked corn, 0.70, 0.73..... .71
Butter, creamery..... .075
Cabbage (raw, chopped), 0.20, 0.16, 0.25, 0.16, 0.18..... .19
Eggs (raw, whole egg thoroughly mixed), 1.88, 1.96, 2.21, 2.23, 2.22, 2.21, 2.31, 2.23..... 2.16
Eggs (cooked, scrambled), 2.28, 2.16, 2.06, 2.17, 2.18, 2.35, 2.06, 2.32, 2.32, 2.22, 2.15, 2.15, 2.20, 2.16..... 2.20
Ham (cold, lean, boiled), 5.31, 4.70, 4.24, 3.77, 4.19..... 4.44
Heart (raw, beef)..... 2.59
Heart juice (from meat press)..... 1.31
Hominy, small, commonly called "grits" (uncooked, air dry), 1.31, 1.31, 1.33.. 1.31
Jam, blackberry (cooked)..... .21
Liver (raw beef)..... 3.38
Liver juice (from meat press)..... 2.43
Meal, corn (raw, not sifted, air dry, local ground), 1.30, 1.35..... 1.32
Meal, corn (raw, sifted, air dry, local ground)..... 1.34
Meal, corn (raw, not sifted, air dry, fine bolted)..... 1.21
Meat (raw, hashed, loin of beef, fat freed), 3.51, 3.52, 3.60, 3.56, 3.53..... 3.54
Milk (Borden's evaporated), 1.01, 1.16..... 1.08
Milk (whole), 0.54, 0.54, 0.56, 0.56, 0.55, 0.56, 0.56, 0.56, 0.55, 0.55, 0.56, 0.55 0.55, 0.55, 0.56, 0.55, 0.56, 0.50, 0.57, 0.56, 0.57, 0.41, 0.48, 0.49, 0.50, 0.51... .54
Orange juice (free from seeds but containing some pulp, Florida oranges), 0.146, 0.139, 0.155..... .146
Pork (raw, salted "bellies")..... .14
Potatoes, white (cooked, mashed), 0.24, 0.29, 0.27, 0.28, 0.27, 0.30, 0.26..... .27
Potatoes, sweet (raw, peeled), 0.39, 0.22, 0.22, 0.14, 0.12, 0.28..... .23
Prunes (raw, air dried, seeds removed)..... .19
Prunes (seeds removed, cooked, minced)..... .27
Rice (uncooked, air dry)..... 1.15
Shredded-wheat biscuit (air dry, ground)..... 1.86
Turnips (raw, immediately after peeling), 0.26, 0.21, 0.14, 0.09, 0.24, 0.24..... .20

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HYGIENIC LABORATORY BULLETINS OF THE PUBLIC HEALTH SERVICE.

The Hygienic Laboratory was established in New York, at the Marine Hospital on Staten Island, August, 1887. It was transferred to Washington, with quarters in the Butler Building, June 11, 1891, and a new laboratory building, located in Washington, was authorized by act of Congress March 3, 1901.

The following *bulletins* [Bulls. Nos. 1–7, 1900 to 1902, Hyg. Lab., U. S. Mar.-Hosp. Serv., Wash.] have been issued:

*No. 1.—Preliminary note on the viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 2.—Formalin disinfection of baggage without apparatus. By M. J. Rosenau.

*No. 3.—Sulphur dioxid as a germicidal agent. By H. D. Geddings.

*No. 4.—Viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 5.—An investigation of a pathogenic microbe (*B. typhi murium* Danyz) applied to the destruction of rats. By M. J. Rosenau.

*No. 6.—Disinfection against mosquitoes with formaldehyde and sulphur dioxid. By M. J. Rosenau.

†No. 7.—Laboratory technique: Ring test for indol, by S. B. Grubbs and Edward Francis; Collodium sacs, by S. B. Grubbs and Edward Francis; Microphotography with simple apparatus, by H. B. Parker.

By act of Congress approved July 1, 1902, the name of the "United States Marine-Hospital Service" was changed to the "Public Health and Marine-Hospital Service of the United States," and three new divisions were added to the Hygienic Laboratory.

Since the change of name of the service the bulletins of the Hygienic Laboratory have been continued in the same numerical order, as follows:

*No. 8.—Laboratory course in pathology and bacteriology. By M. J. Rosenau. (Revised edition, March, 1904.)

†No. 9.—Presence of tetanus in commercial gelatin. By John F. Anderson.

*No. 10.—Report upon the prevalence and geographic distribution of hook-worm disease (uncinariasis or anchylostomiasis) in the United States. By Ch. Wardell Stiles.

*No. 11.—An experimental investigation of *Trypanosoma lewisi*. By Edward Francis.

*No. 12.—The bacteriological impurities of vaccine virus; an experimental study. By M. J. Rosenau.

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*No. 17.—Illustrated key to the trematode parasites of man. By Ch. Wardell Stiles.

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*No. 21.—The immunity unit for standardizing diphtheria antitoxin (based on Ehrlich's normal serum). Official standard prepared under the act approved July 1, 1902. By M. J. Rosenau.

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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

HYGIENIC LABORATORY—BULLETIN No. 103
FEBRUARY, 1916.

I. CHEMICAL CHANGES IN THE CENTRAL NERVOUS SYSTEM AS A RESULT OF RESTRICTED VEGETABLE DIET.—By Mathilde L. Koch and Carl Voegtlin

II. CHEMICAL CHANGES IN THE CENTRAL NERVOUS SYSTEM IN PELLAGRA.—By Mathilde L. Koch and Carl Voegtlin

WASHINGTON
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1916

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PUBLIC HEALTH
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I. CHEMICAL CHANGES IN THE CENTRAL NERVOUS SYSTEM AS A RESULT OF RESTRICTED VEGETABLE DIET.[1]

By MATHILDE KOCH, Special Expert, and CARL VOEGTLIN, Professor of Pharmacology, United States Public Health Service.

The belief among physiologists and pathologists that the central nervous system is not apt to be influenced in its composition by variations in diet, or even by starvation, is deeply rooted. This is to some extent due to the fact that the function of the central nervous system is of such vital importance to the organism that nature has protected itself in such a way that the chemical composition of the central nervous system is changed only under extreme pathological conditions. It is necessary merely to refer to the importance of the nervous system as the medium for the propagation of a state of stimulation or inhibition to the other organs of the body. The nervous system, therefore, is an important regulator of the normal functions of the whole organism.

The data concerning the influence of changes in diet on the chemical composition and weight of the central nervous system are very meager. Voit[2] showed that starvation does not materially affect the weight of the brain and cord. The weight of these organs is maintained at the expense of other tissues (muscle, adipose tissue, etc.).

Danaldson[3] found that temporary underfeeding of albino rats (30 days old) with a diet, the composition of which is not described any further than that it "contained some proteids, but was small in amount," produced the following changes in the composition of the brain:

1. A slight diminution in the percentage of water (0.1 per cent).

2. The percentage of total lipoids increases in the underfed animals during the 21 days of underfeeding by 1.15 per cent, while the effect of underfeeding in animals of like age at death is to increase the total

[1] Manuscript submitted for publication July 27, 1915.

[2] Zeitschr. f. Biol., 1894.

[3] Donaldson, Jour. Comp. Neurol., 1911. XXI. 139.

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lipoids only by 0.7 per cent; thus, an increase in sheathing substance occurs while underfeeding is in progress (Hatai), although some of the relative increase in the total lipoids must probably be credited to the destructive changes in the neuron caused by the underfeeding.

3. The Weigert stain for the medullary sheaths does not reveal in the brain any notable difference in medullation between the underfed and the control rats. It is inferred that underfeeding does not arrest medullation.

Donaldson does not describe in the body of this paper the nature of the destructive changes in the neuron referred to above (under 2).

In another publication Donaldson[1] reports further experiments on albino rats, showing "that underfeeding, which stops the growth of the body and retards that of the nervous system, does not modify the percentage of water in the spinal cord, while it does reduce it in the brain; the amount of this reduction being less severe in the cases where underfeeding is less severe."

Infectious diseases, such as pneumonia, cause a marked deficiency (0.5 per cent) in the water content of the brain (Donaldson). Castration, on the other hand, "although it arrests somewhat the growth of the brain and spinal cord, does not modify the percentage of water in these organs." Donaldson believes that the changes in the percentage of water in the central nervous system of the albino rat which can be induced experimentally are usually less than 0.5 per cent in amount, and they depend more on the metabolic activities of the body as a whole than on those of the nervous system alone. When anabolic processes predominate the percentage of water tends to increase. When catabolic processes predominate the percentage of water tends to decrease.

It should here be emphasized that the changes in the water content of the brain, as observed by Donaldson under experimental conditions, are extremely small. It is questionable if one can draw definite conclusions from such small variations from the normal.

Salkowski[2] tried in vain to increase the phosphatide content of the brain of rabbits by feeding kephalin.

Hatai[3] and others found that in young rats phosphatides isolated from brain, if injected subcutaneously or fed, produced a marked increase in the rate of growth of the animal, with no change from the normal in the water content of the brain, the microscopical appearance of the nerve fibers, or the relative weight of the central nervous system to body weight.

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[1] Donaldson, Jour. Comp. Neurol., 1911. XXI. 161.
[2] Salkowski, Biochem., Zeitchr., vol. 51, p. 407.
[3] Amer. Jour. Physiol., 1903. X. 65.

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By far the most interesting histological changes in the nervous system were observed by Eykman[1] in fowl, as the result of an exclusive diet of polished rice. Symptoms of polyneuritis and corresponding histological changes appear in the peripheral nerves of such animals.

Schaumann[2] was not able to detect chemical differences in the brains of fowl with polyneuritis, as compared with normal brains.

Funk,[3] however, claims to have found a slight loss of total nitrogen and a more marked loss in the total phosphorus content of pigeons with polyneuritis. The following table gives the results of his experiments:

	Initial body weight.	Final body weight.	Brain wet.	Brain dry.	N., in per cent.	P., in per cent.	N., in grams.	P., in grams.
Normal pigeons, average	320	.....	1.80	0.3848	9.77	1.84	0.0376	0.0070
Polyneuritis, average	300	232	1.75	.3602	9.31	1.53	.0337	.0055
Cured of polyneuritis, average	314	259	1.82	.3914	9.37	1.57	.0367	.0061
Underfed pigeons, average	352	269	1.98	.4330	9.62	1.85	.0417	.0080

Summing up our present knowledge of the chemical changes produced experimentally in the central nervous system as a result of changes in diet it may be said that:

1. Underfeeding (mixed diet) does not lead to any marked changes, with the exception of a slight variation in the water content.
2. Starvation does not seem to alter the composition of the brain.
3. An exclusive diet of polished rice leads to a diminution of the nitrogen and phosphorus content of the brains of pigeons.

EXPERIMENTS.

The present investigation represents an attempt to produce in various species of animals (monkeys, rats) changes in the chemical composition of the brain and cord, resembling those described in the following communication as occurring in pellagra.

Voegtlin[4] has recently advanced the hypothesis that pellagra is due to a mainly vegetable diet, characterized by a relatively low percentage of protein and a correspondingly high content in carbohydrates. Based on this hypothesis Voegtlin fed a large number of animals (monkeys, rats, mice, hogs, and fowl) on a restricted diet of all kinds of cereals and vegetables. The main conclusions drawn from these feeding experiments are the following:

[1] Eykman, Virchow's Arch., 1897, vol. 148, p. 523. Ibid., Arch. d. Hyg., 1906, vol. 58, 150.

[2] Schaumann, Arch. f. Schiffs. u. Tropenhygiene, Beiheft 8. 1910.

[3] Funk, Jour. Physiol., 1912, vol. 44, p. 50.

[4] Voegtlin, Am. Jour. Physiol., 1915, Proceedings. Voegtlin, Jour. Amer. Med. Asso., 1914, vol. 63, p. 1094.

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1. An exclusive diet of cereals and vegetables is insufficient for the preservation of the normal functions of the body (in certain mammalia). Sooner or later symptoms appear pointing to a disturbance in the functions of the nervous system and the gastro-intestinal canal. Increased or decreased reflex excitability and strychninelike convulsions are noticed. Monkeys show in the later stages of the feeding period a lack of interest in their surroundings, which may possibly be due to changes in the central nervous system. They sit in their cages and can not be aroused from a more or less pronounced stupor.

2. Fowl (pigeons, chickens) can live in perfect health on an exclusive diet of cereals (whole).

Thus, it is obvious that some of the highly organized mammalia, phylogenetically nearest to man, are subjected to morbid symptoms, and even loss of life, as the result of an exclusive vegetable diet of the above composition.

The central nervous system of a relatively small number of these animals used in the previous investigation was used for the purpose of histological and chemical study. Dr. Sundwall took charge of the histological examination, and the data relating thereto are taken from his notes.

The methods of collection and chemical analysis used were the same as those described in the paper on "The chemical changes in the nervous system in pellagra." It is therefore legitimate to compare the changes noted in the animal tissues with those found in pellagra.

EXPERIMENTS ON MONKEYS.

One normal monkey (Rhesus Macacus), fed on a mixed diet and killed while in perfect health by means of chloroform, was used as a normal standard for the composition of the encephalon and spinal cord. Six monkeys, fed on different diets, were used for the pathological material. The composition of the diet in these animals follows:

Monkeys M. I and M. II: Corn-oil cake. This food represents the embryo of the corn kernel which is separated by machinery from the starchy part and the husk. The original embryo is deprived of the largest amount of its fat content by hydraulic presses. The residue, after removing the oil, is ground to a meal, which is very rich in protein (about 30 per cent) and contains a sufficient quantity of carbohydrate and fat. This corn-oil cake meal is poor in substances preventing beriberi (Vitamines).

Monkey M. III: Equal parts of corn meal and sweet potatoes. This mixture was made into cakes, which were dried at a low tempera-

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ture (not exceeding 40–50° C.). Without going into details it may be said that this diet is rich in carbohydrates and poor in protein and fat.

Monkey M. IV and MV: Corn meal. This diet has approximately the following composition: Water, 12.5 per cent; protein, 9.2 per cent; fat, 1.9 per cent; total carbohydrates, 75.4 per cent; ash, 1 per cent; calorific value per pound, 1,645.

Monkey M. VII: Raw carrots. The average composition of this diet is: Water, 88.2 per cent; protein, 1.1 per cent; fat, 0.4 per cent; total carbohydrates, 9.3 per cent; ash, 1 per cent; caloric value per pound, 210. In this animal only the total nitrogen and total phosphorus of the fresh encephalon was determined.

Unfortunately the available time did not permit the analyses of more than one normal encephalon and spinal cord of the monkey. The analysis of the one normal monkey was, however, done in duplicate, which agreed very closely. The only data in the literature bearing on the quantitative chemical composition of this species are those of Linnert, obtained by means of Fraenkel's method.

Linnert's data agree fairly closely with the figures obtained in this investigation.

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TABLE 1.—*Monkey, encephalon—Relative proportions of constituents in per cent of fresh tissue.*

Laboratory and case Nos.	Weight of fresh encephalon.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
55, M. VI, normal	81.59	77.0	23.0	6.22	1.77	2.04	2.31	10.90	10.02	2.13
				5.90			2.34			
Average				6.06	1.77	2.04	2.33	10.90	10.02	2.13
41, M. I, corn-oil cake	79.10	78.0	22.0	5.82	1.62	1.83	1.94	10.98	9.35	1.68
45, M. II, corn-oil cake	79.30	79.3	20.7	5.62	1.16	1.52	1.93	10.25	8.94	1.55
Average		78.6	21.3	5.72	1.39	1.67	1.93	10.61	9.14	1.61
Percentage variation from normal		+ 2	− 7	− 5	−21	−18	−17	− 2	− 9	−24
49, M. III, corn meal and sweet potato	87.00	79.2	20.8	5.57	1.08	1.43	2.08	9.88	9.00	1.99
Percentage variation from normal		+ 3	− 9	− 8	−39	−29	−10	− 9	−10	− 6
47, M. IV, corn meal	72.1	80.5	19.5	5.27	1.15	1.57	1.89	8.89	8.53	2.11
48, M. V, corn meal	75.4	78.8	21.2	5.49	1.37	1.31	1.73	9.42	9.44	2.32
Average		79.6	20.3	5.38	1.26	1.44	1.81	9.15	8.98	2.21
Percentage variation from normal		+ 3	−11	−11	−28	−29	−22	−16	−10	+ 3

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TABLE 2.—*Monkey, encephalon—Relative proportions of constituents in per cent of solids.*

Laboratory and case Nos.	Weight of fresh encephalon.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids—
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
55, M. VI, normal	81.59	77.0	23.0	27.03 25.58	7.71	8.85	10.04 10.18	47.3	43.5	9.22
Average				26.58	7.71	8.85	10.10	47.3	43.5	9.22
41, M. I, corn-oil cake	79.14	78.0	22.0	26.44	7.37	8.33	8.8	49.8	42.5	7.66
45, M. II, corn-oil cake	79.30	79.3	20.7	27.13	5.60	7.73	9.3	49.4	43.1	7.48
Average	79.22	78.6	21.3	26.78	6.48	8.03	9.0	49.6	42.8	7.57
Percentage variation from normal		+ 2	− 7	± 0	−16	− 9	−10	+ 4	− 2	−18
49, M. III, corn meal and sweet potato	87.0	79.2	20.8	26.68	5.18	6.83	9.9	47.3	43.1	9.54
Percentage variation from normal		+ 3	− 9	± 0	−32	−23	± 0	± 0	± 0	+ 3
47, M. IV, corn meal	72.1	80.5	19.5	27.01	5.87	8.04	9.68	45.5	43.7	10.80
48, M. V, corn meal	75.4	78.8	21.2	25.92	6.46	6.21	8.2	44.5	44.5	10.95
Average	73.7	79.6	20.3	26.46	6.16	7.21	8.94	45.0	44.1	10.37
Percentage variation from normal		+ 3	−12	± 0	−20	−18	−11	− 4	+ 1	+12

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TABLE 3.—*Monkey, encephalon—Relative proportions of lipoids in per cent of total lipoids.*

Laboratory and case Nos.	Content of water in per cent.	Total lipoids in per cent of fresh tissue.	Total lipoids in per cent of solids.	Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.
55, M. VI, normal	77.0	10.90	47.3	{ 57.14 54.08 }	16.30	18.71	{ 21.22 21.51
Average	77.0	10.90	47.3	55.61	16.30	18.71	21.36
41, M. I, corn-oil cake	78.0	10.98	49.8	53.09	14.79	16.72	17.67
45, M. II, corn-oil cake	79.3	10.25	49.4	54.91	11.33	15.64	18.82
Average	78.6	10.61	49.6	54.00	13.06	16.18	18.25
Percentage variation from normal	+ 2	− 2	+ 4	− 3	−20	−13	−14
49, M. III, corn meal and sweet potato	79.2	9.88	47.3	56.40	13.70	16.97	19.02
Percentage variation from normal	+ 3	− 9	± 0	+ 1	−16	− 9	−11
47, M. IV, corn meal	80.5	8.89	45.5	59.35	12.92	17.67	21.27
48, M. V, corn meal	78.8	9.42	44.5	58.24	14.51	13.95	18.42
Average	79.6	9.15	45.0	58.80	13.71	15.81	19.84
Percentage variation from normal	+ 3	−16	− 4	+ 5	−15	−15	− 7

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TABLE 4.—*Monkey, encephalon—Distribution of sulphur, phosphorus, and nitrogen in per cent of fresh tissue.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
55, M. VI, normal	0.094	0.041	0.015	0.006	0.156	0.051	0.241	0.058	0.351	1.480	0.153	0.136	1.770
						.046	.228	.060	.335	1.635	.145	.156	1.936
Average	.094	.041	.015	.006	.156	.049	.234	.059	.343	1.557	.149	.146	1.850
41, M. I, corn-oil cake	.093	.036	.014	.002	.145	.049	.226	.040	.315	1.404	.208	.141	1.830
										1.425	.263	.139	
45, M. II, corn-oil cake	.076	.030	.013	.001	.120	.042	.218	.031	.291	1.368	.127	.193	1.688
										1.370			
Average	.084	.033	.013	.002	.132	.045	.222	.035	.303	1.386	.181	.166	1.759
Percentage variation from normal	−10	−19	−13	−66	−15	− 8	− 5	−40	−11	−10	+21	+13	−5
49, M. III, corn meal and sweet potato	.082	.028	.015	.004	.129	.044	.216	.037	.297	1.351	.161	.248	1.760
Percentage variation from normal	−13	−32	± 0	−33	−17	−10	− 7	−38	−13	−13	+ 8	+69	−5
47, M. IV, corn meal	.084	.031	.010	.004	.129	.046	.204	.041	.291	1.110	.173	.273	1.556
48, M. V, corn meal	.090	.026	.008	.004	.128	.046	.213	.036	.295	1.470	.213	.146	1.829
Average	.087	.028	.009	.004	.128	.046	.208	.038	.293	1.290	.193	.209	1.692
Percentage variation from normal	− 7	−32	−40	−33	−18	− 6	−11	−36	−14	−17	+29	+43	−8

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TABLE 5.—*Monkey, encephalon—Distribution of sulphur, phosphorus, and nitrogen in per cent of solids.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
55, M. VI, normal	0.410	0.177	0.064	0.027	0.678	0.222	1.050	0.253	1.52	6.42	0.651	0.590	7.67
						.200	.991	.263	1.45	7.10	.629	.677	8.41
Average	.410	.177	.064	.027	.678	.211	1.020	.258	1.48	6.76	.640	.633	8.04
41, M. I, corn-oil cake	.422	.166	.060	.012	.660	.222	1.026	.185	1.43	6.47	1.190	.642	8.30
										6.47		.632	
45, M. II, corn-oil cake	.366	.146	.059	.008	.579	.205	1.053	.142	1.40	6.60	.614	.929	9.12
										6.53			
Average	.394	.156	.059	.010	.619	.213	1.039	.163	1.42	6.52	.902	.783	8.21
Percentage variation from normal	−4	−11	− 8	−63	−8	±0	+2	−37	−4	−3	+41	+23	+2
49, M. III, corn meal and sweet potato	.392	.137	.067	.022	.618	.212	1.035	.179	1.426	6.473	.773	1.191	8.44
Percentage variation from normal	−4	−22	+ 4	−18	−8	±0	+1	−30	−4	−4	+20	+88	+5
47, M. IV, corn meal	.429	.161	.057	.017	.664	.238	1.048	.204	1.490	5.690	.887	1.400	7.96
48, M. V, corn meal	.424	.124	.053	.015	.606	.216	1.006	.172	1.394	6.930	1.005	.688	8.62
Average	.424	.142	.055	.016	.635	.227	1.027	.188	1.442	6.310	.946	1.044	8.30
Percentage variation from normal	+3	−19	−14	−40	−6	+8	±0	−27	−2	−7	+47	+64	+3

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TABLE 6.—*Monkey, encephalon—Distribution of sulphur, phosphorus, and nitrogen in per cent of total sulphur, total phosphorus, and total nitrogen.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
55, M. VI, normal	60.43	26.10	9.39	4.08	0.678	14.60	68.77	16.62	1.52	84.00	8.00	8.00	7.67
						13.78	68.22	18.00	1.45	83.83	8.49	7.70	8.41
Average	60.43	26.10	9.39	4.08	.678	14.19	68.49	17.31	1.48	83.91	8.24	7.85	8.04
41, M. I, corn-oil cake	63.95	25.23	9.02	1.80	.660	15.53	71.60	12.87	1.43	77.94	14.40	7.73	8.30
												7.62	
45, M. II, corn-oil cake	63.17	25.30	10.09	1.44	.579	14.60	75.00	10.40	1.40	80.97	7.56	11.45	8.12
Average	63.56	25.26	9.55	1.62	.619	15.06	73.3	11.63	1.42	79.45	10.98	9.56	8.21
Percentage variation from normal	+ 5	− 3	+ 2	−60	−8	+ 6	+ 7	−33	−4	− 5	+33	+21	+2
49, M. III, corn meal and sweet potato	63.40	22.10	11.00	3.50	.618	14.89	72.61	12.50	1.42	76.72	9.16	14.11	8.44
Percentage variation from normal	+ 5	−15	+17	−14	−8	+ 5	+ 6	−27	−4	− 8	+11	+80	+5
47, M. IV, corn meal	64.55	24.21	8.71	2.53	.664	16.00	73.00	13.70	1.49	71.42	11.14	17.60	7.98
48, M. V, corn meal	69.90	20.46	7.15	2.49	.606	15.52	72.18	12.30	1.39	80.34	11.65	7.89	8.62
Average	67.22	22.33	7.93	2.51	.635	15.76	72.59	13.00	1.44	75.88	11.39	12.74	8.30
Percentage variation from normal	+11	−14	−15	−38	−6	+11	+ 6	−25	−2	− 9	+38	+62	+3

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TABLE 7.—*Monkey, spinal cord—Relative proportions of constituents in per cent of fresh tissue.*

Laboratory and case Nos.	Weight of fresh spinal cord.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.[1]	Sulphatides.	Cholesterol.	Total lipoids.		
56, M. VI, normal	5.74	68.7	31.3	10.13	2.07	4.13	4.54	20.87	8.78	1.65
43, M. I and M. II, corn-oil cake	4.93	69.5	30.5	8.88	3.71	3.75	4.46	20.80	8.15	1.51
Percentage variation from normal		+ 1	− 2	−12	+84	− 9	− 2	± 0	− 7	− 8
52, M. III, corn meal and sweet potato	4.50	70.4	29.6	9.51	1.57	4.36	3.98	19.42	8.42	1.80
Percentage variation from normal		+ 2	− 5	− 6	−24	+ 5	−12	− 7	− 4	+ 9
50, M. IV and M. V, corn meal	4.00	67.7	32.3	9.58	3.55	3.43	4.54	21.10	8.95	1.50
Percentage variation from normal		− 1	+ 3	− 5	+71	−17	± 0	+ 1	+ 1	− 9

[1] Obtained by difference.

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TABLE 8.—*Monkey, spinal cord—Relative proportions of constituents in per cent of solids.*

Laboratory and case Nos.	Weight of fresh spinal cord.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.[1]	Sulphatides.	Cholesterol.	Total lipoids.		
56, M. VI, normal	5.74	68.7	31.3	32.30	6.66	13.20	14.49	66.65	28.07	5.30
43, M. I and M. II, corn-oil cake	4.93	69.5	30.5	29.14	12.83	12.31	14.60	68.28	26.77	4.95
Percentage variation from normal		+ 1	− 2	−10	+83	− 7	± 0	+ 2	− 5	− 7
52, M. III, corn meal and sweet potato	4.50	70.4	29.6	32.10	5.28	14.71	13.43	65.52	28.40	6.08
Percentage variation from normal		+ 2	− 5	± 0	−20	+11	− 7	− 2	+ 1	+15
50, M. IV and M. V, corn meal	4.00	67.7	32.3	30.36	11.23	10.86	14.41	66.86	28.37	4.77
Percentage variation from normal		− 1	+ 3	− 6	+68	−18	± 0	± 0	+ 1	−10

[1] Obtained by difference.

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TABLE 9.—*Monkey, spinal cord—Relative proportions of lipoids in per cent of total lipoids.*

Laboratory and case Nos.	Content of water in per cent.	Total lipoids in per cent of fresh tissue.	Total lipoids in per cent of solids.	Phosphatides.	Cerebrosides.[1]	Sulphatides.	Cholesterol.
56, M. VI, normal	68.7	20.87	66.65	48.67	9.91	19.7	21.7
43, M. I and M. II, corn-oil cake	69.5	20.80	68.28	42.67	17.93	18.0	21.4
Percentage variation from normal	+1	±0	+2	−12	+81	− 8	−1
52, M. III, corn meal and sweet potato	70.4	19.42	65.52	48.99	8.11	22.4	20.5
Percentage variation from normal	+2	−7	−2	+1	−18	+13	−5
50, M. IV and M. V, corn meal	67.7	21.10	66.86	45.39	16.91	16.2	21.5
Percentage variation from normal	−1	+1	±0	− 7	+70	−18	±0

[1] Obtained by difference.

TABLE 10.—*Monkey, spinal cord—Distribution of sulphur and phosphorus in per cent of fresh tissue.*

Laboratory and case Nos.	Sulphur.				Phosphorus.			
	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
56, M. VI, normal	0.102	0.083	0.022	0.207	0.054	0.393	0.032	0.479
43 M. I and M. II, corn-oil cake	.084	.075	.024	.183	.043	.344	.030	.417
Percentage variation from normal	−18	−10	+ 9	−11	−20	−12	− 6	−13
52, M. III, corn meal and sweet potato	.125	.087	.029	.241	.047	.369	.035	.451
Percentage variation from normal	+22	+ 4	+31	+16	−13	− 6	+ 9	− 6
50 M. IV and M. V, corn meal	.090	.068	.020	.178	.046	.342	.023	.411
Percentage variation from normal	−11	−18	− 9	−14	−15	−13	−28	−14

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TABLE 11.—*Monkey, spinal cord—Distribution of sulphur and phosphorus in per cent of total solids.*

Laboratory and case Nos.	Sulphur.				Phosphorus.			
	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
56, M. VI, normal	0.327	0.264	0.069	0.660	0.172	1.254	0.105	1.53
43, M. I and M. II, corn-oil cake	.275	.246	.062	.603	.143	1.131	.095	1.37
Percentage variation from normal	−16	− 7	+19	− 9	−17	−10	−10	−10
52, M. III, corn meal and sweet potato	.422	.294	.097	.813	.159	1.246	.118	1.52
Percentage variation from normal	+29	+11	+40	+23	− 7	± 0	+12	± 0
50, M. IV and M. V, corn meal	.285	.217	.064	.566	.147	1.179	.074	1.40
Percentage variation from normal	−13	−18	− 7	−14	−14	− 6	−30	− 9

TABLE 12.—*Monkey, spinal cord—Distribution of sulphur and phosphorus in per cent of total sulphur and total phosphorus.*

Laboratory and case Nos.	Sulphur.				Phosphorus.			
	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
56, M. VI, normal	49.4	39.98	10.57	0.66	11.20	81.96	6.84	1.53
43, M. I and M. II, corn-oil cake	45.6	40.87	13.50	.60	10.47	82.68	6.92	1.37
Percentage variation from normal	−7	+2	+28	− 9	−7	±0	+ 1	−10
52, M. III, corn meal and sweet potato	51.80	36.12	12.08	.813	10.50	81.80	7.70	1.52
Percentage variation from normal	+4	−9	+14	+23	−6	±0	+12	± 0
50, M. IV and M. V, corn meal	50.28	38.42	11.30	.56	10.48	84.30	5.22	1.40
Percentage variation from normal	+1	−4	+ 7	−14	−6	+2	−23	− 9

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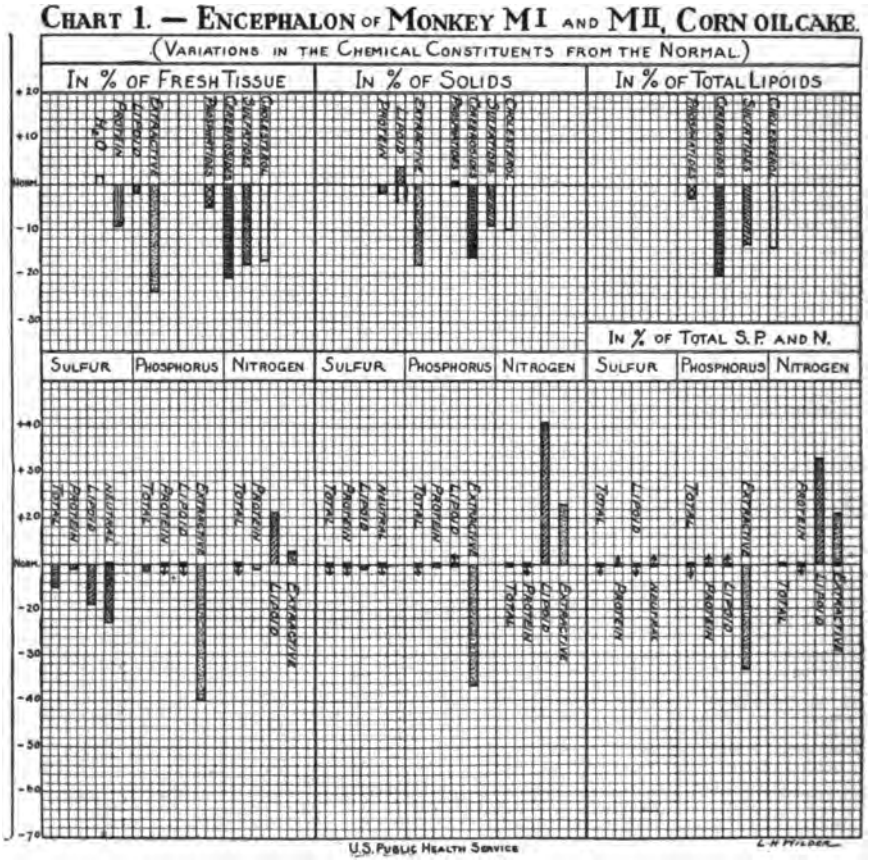
CHART 1. — ENCEPHALON OF MONKEY MI AND MII, CORN OILCAKE.
(VARIATIONS IN THE CHEMICAL CONSTITUENTS FROM THE NORMAL.)
IN % OF FRESH TISSUE
IN % OF SOLIDS
IN % OF TOTAL LIPOIDS
IN % OF TOTAL S. P. AND N.
SULFUR
PHOSPHORUS
NITROGEN
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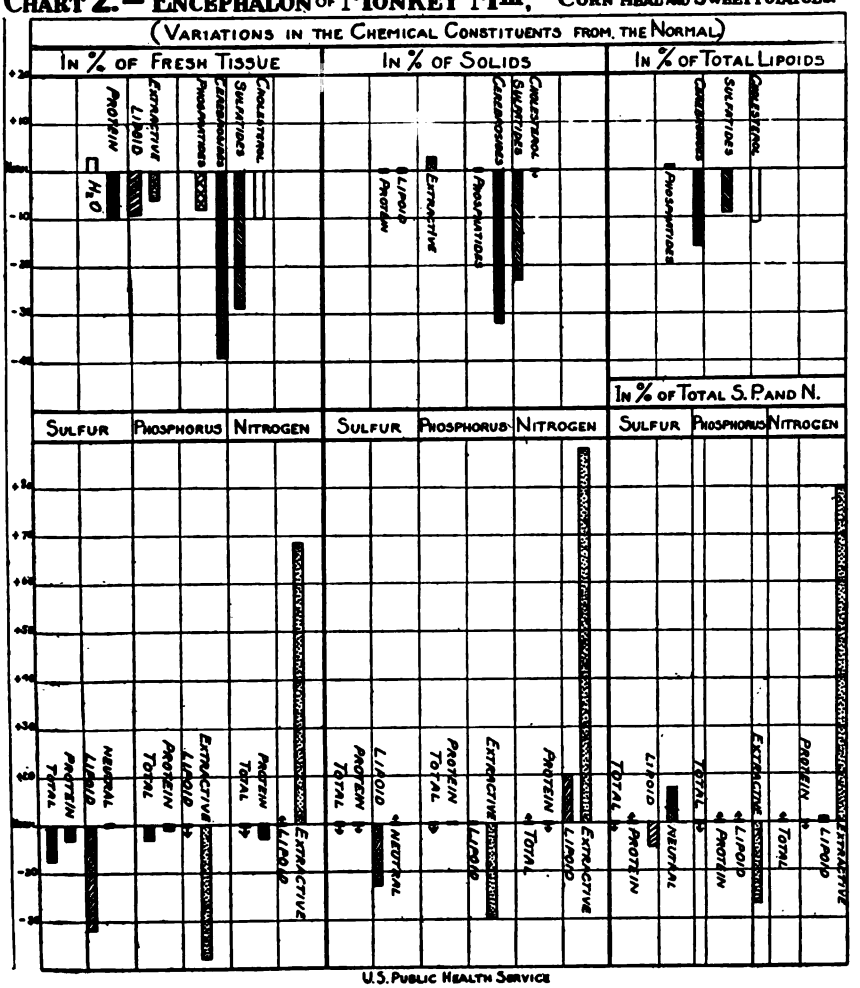

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CHART 3.— ENCEPHALON OF MONKEY MIV AND MV, CORNMEAL.

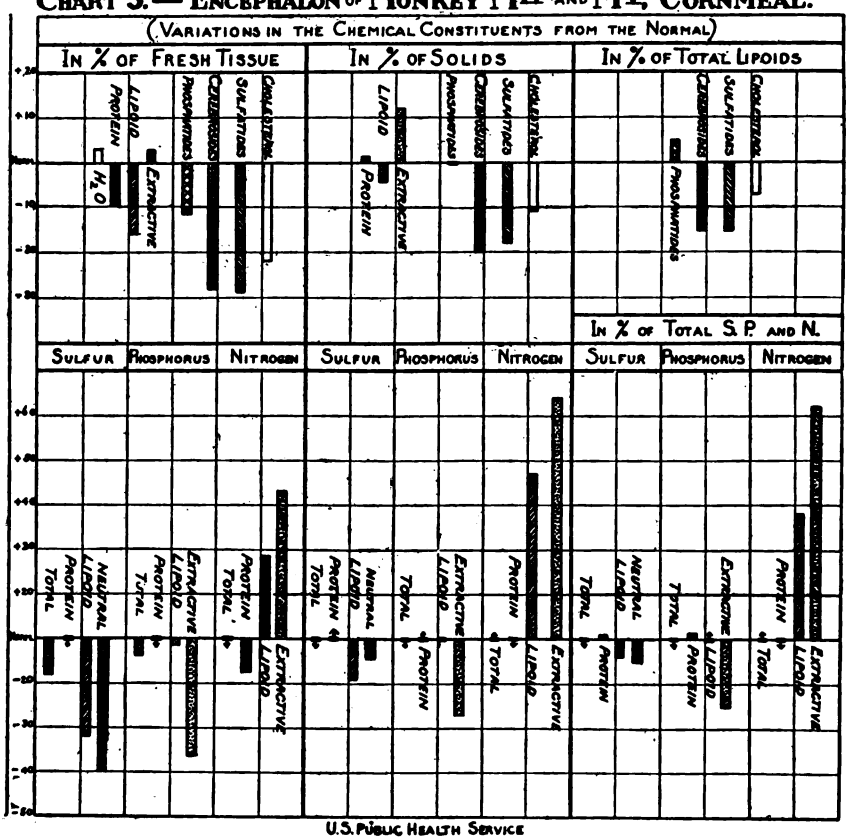

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CHART 4.—SPINAL CORD OF MONKEY M^{I} AND M^{II}, CORN OIL CAKE.

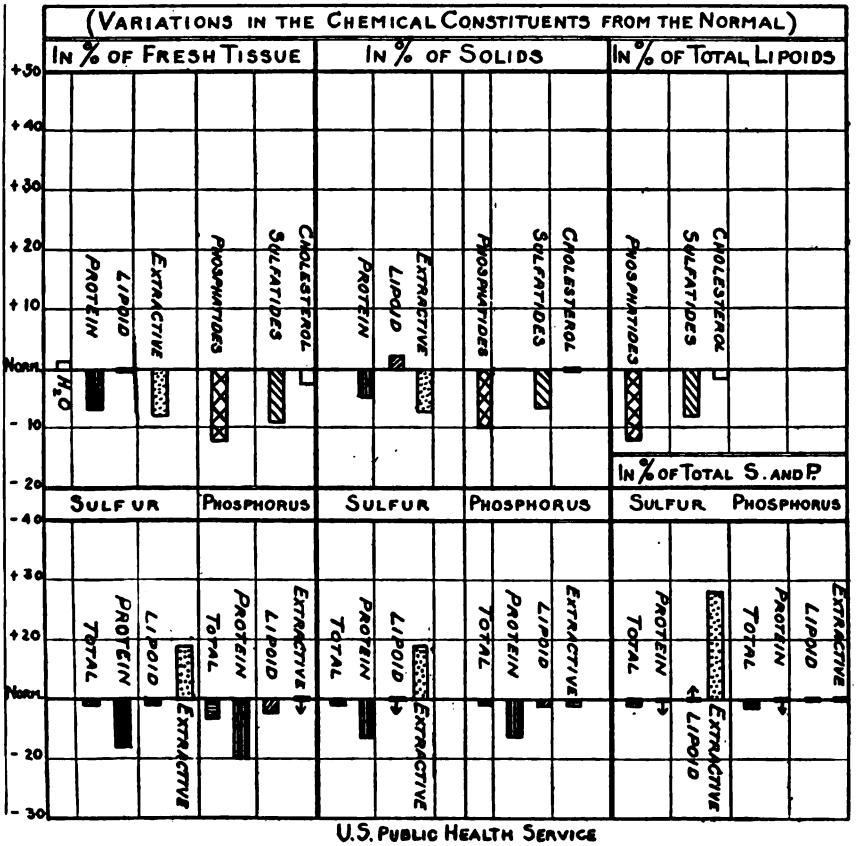

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CHART 5.— SPINAL CORD OF MONKEY M III. CORN MEAL AND SWEET POTATOES.

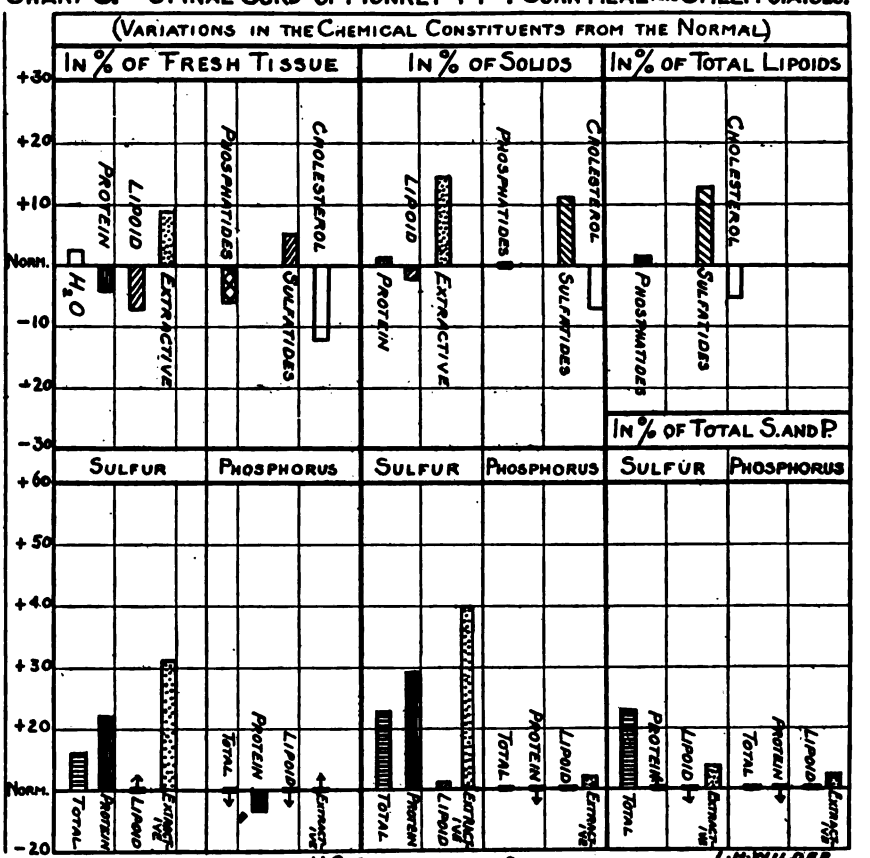

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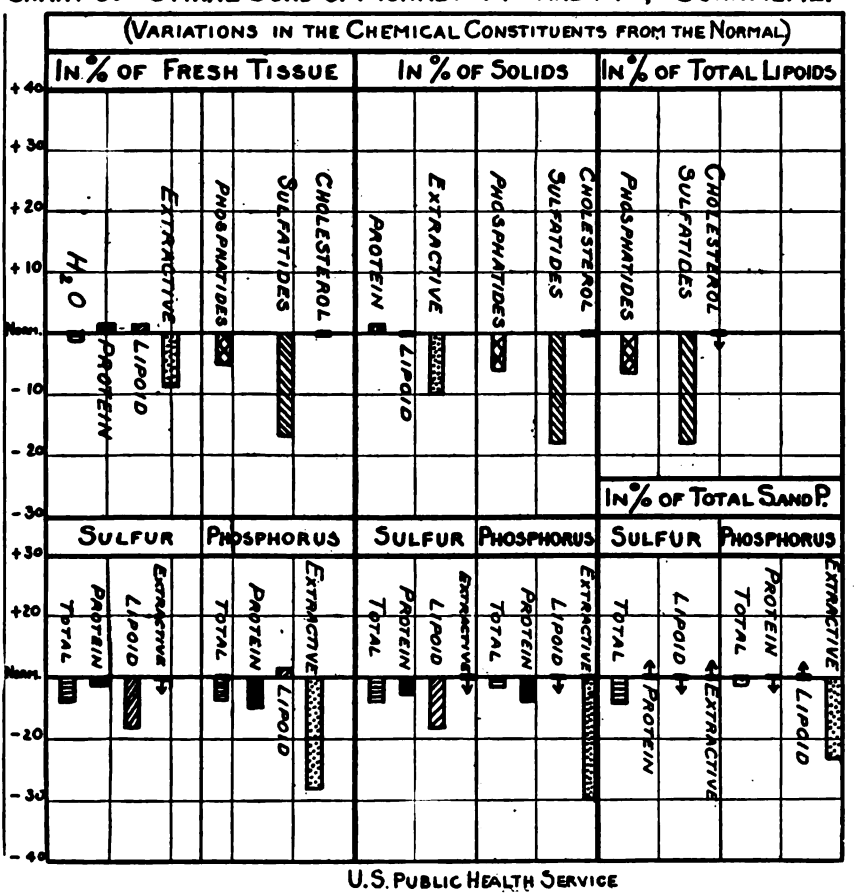
CHART 6.—SPINAL CORD OF MONKEY M^{IV} AND M^{V}, CORNMEAL.



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EXPERIMENTS ON ALBINO RATS.

The albino rats were fed entirely on cakes made from corn-oil cake meal of the same composition as that fed to monkey M. I and M. II. The rats were obtained from the Wistar Institute in Philadelphia. They were perfectly healthy animals of known age. In order to obtain large enough samples for chemical analysis it was necessary to prepare a mixed sample of the encephalon from 15 to 30 rats. The usual precautions were observed in the collection of the material, the brain and cord being removed as soon as possible after death. In some respects a mixed sample of this kind rules out the individual variations in the composition of the nervous system and any variations from the normal can be considered as pathological. The samples of spinal cord were naturally very small and the data pertaining to this tissue should not be considered as absolutely accurate.

The following tables give all the necessary information in regard to the rat material:

TABLE 13.—*Adult albino rats, 96 days old at beginning of experiment; chloroformed after 35 days' feeding. (Laboratory No. 22.)*

Case No.	No. of animal.	Number of days fed.	Total amount food eaten in grams.	Initial body weight in grams.	Final body weight in grams.	Loss in body weight in grams.	Weight of brain.	Weight of cord.
R. I.								
Lot I	1	35	301.6	127	126	− 1	1.6450	0.4099
	2	35	299.3	123	96	−27	1.5999	.3915
	3	35	294.1	122	120	− 2	1.5360	.3835
	4	35	283.1	112	103	− 9	1.4756	.3420
Average	4	35	294.5	121	111	−10	1.5830	.3910
Lot II	1	35	304.4	196	170	−26	1.5750	.4099
	2	35	316.8	150	133	−17	1.5684	.3295
	3	35	286.7	175	148	−27	1.5430	.3985
	4	35	318.1	187	170	−17	1.6443	.4255
Average	4	35	306.5	177	155	−22	1.564	.3817
Lot III	1	27	245	128	123	− 5	1.4902	.3529
	2	27	223	168	123	−43	1.5213	.4106
Average	2	27	234	147	123	−24	1.507	.372
R. IV.								
Lot IV	1	37	296	200	180	−20	1.6783	.3956
	2	37	272	122	108	−14	1.4306	.2344
	3	37	276	105	97	− 8	1.7000	.1117
	4	37	268	135	123	−12	1.5191	.3882
	5	37	264	121	105	−16	1.6099	.3581
Average	5	37	275	136	122	−14	1.588	.2976
Lot V	1	37	270	154	92	−62	1.3899	.3538
	2	37	256	129	69	−60	1.2671	.2812
	3	37	280	138	75	−63	1.4250	.3910
	4	37	248	99	90	− 9	1.4251	.3017
	5	37	288	132	114	−18	1.5031	.3027
	6	37	252	108	88	−20	1.4150	.3135
	7	37	296	134	104	−30	1.4760	.3293
Average	7	37	270	149	91	−58	1.4144	.3276
Pathological average		35	276	146	120	−26	1.5200	.3500
Normal average				146			1.7740	.560

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TABLE 14.—*Half-grown albino rats, 41 days old at beginning of experiment; collected brain and cord as animals died.* (*Laboratory No. 23.*)

Case No.	No. of animal.	Number of days fed.	Total amount food eaten in grams.	Initial body weight in grams.	Final body weight in grams.	Loss in body weight in grams.	Weight of brain.	Weight of cord.
R. II.								
Lot VI	1	18	80	25	26	+ 1	1.2715	0.2000
	2	18	88	29	30	+ 1	1.2658	.....
	3	25	104	37	26	−11	1.2188	.2073
	4	26	120	30	28.5	− 1.5	1.2954	.2211
	5	35	196	46	35	−11	1.1995	.2188
	6	34	176	40	32	− 8	1.1972	.2000
	7	29	160	47	36	−11	1.3180	.2395
Average	.....	26	132	35	30.5	− 4.5	1.2510	.2144
Lot VII	1	24	104	45	31	−14	1.315	.....
	2	32	192	59	38	−21	1.2324	.1587
	3	32	172	49	35	−14	1.1725	.1735
	4	29	148	57	43.5	−13.5	1.2667	.2230
	5	33	176	51	39	−12	1.3243	.2510
	6	47	280	76	74	− 2	1.4575	.2663
Average	.....	33	178	56	43.4	−12.6	1.249	.2148
Pathological average	.....	29	153	45	37	− 9	1.250	.2150
Normal average	.....	.....	.....	45	.....	.....	1.4350	.450

TABLE 15.—*Half-grown albino rats, 46 days old at beginning of experiment; collected brain and cord as animals died.* (*Laboratory No. 31.*)

Case No.	No. of animal.	Number of days fed.	Total amount food eaten in grams.	Initial body weight in grams.	Final body weight in grams.	Loss in body weight in grams.	Weight of brain.	Weight of cord.
R. III.								
Lot IX [1]	3	14	96	40	38	− 2	1.3447	0.2094
	4	7	40	29	33	+ 4	1.2429	.1833
	5	7	36	33	33	± 0	1.3277	.1703
	7	36	200	53	42	−11	1.2443	.....
	8	23	116	40	30	−10	1.3083	.2074
	9	18	104	52	47	− 5	1.3757	.....
	10	24	136	42	40	− 2	1.3806	.2220
	13	5	26	38	33	− 5	1.3197	.2032
	15	15	104	48	47	− 1	1.2836	.1881
	16	34	220	38	39	+ 1	1.1943	.....
	18	26	156	45	44	− 1	1.1563	.....
	19	13	72	35	26	− 9	1.1939	.....
	20	8	32	27	25	− 2	1.3807	.1692
	21	23	132	43	36	− 7	1.1220	.0925
	23	12	94	42	48	+ 6	1.4654	.2050
	24	34	144	41	29	−12	1.3555	.2191
Average	.....	18	106	40	37	− 3	1.293	.1880
Lot X [1]	3	4	16	58	52	− 6	1.2662	.2554
	4	22	136	59	54	− 5	1.3539	.....
	7	5	28	67	.....	.....	1.4190	.2337
	14	13	74	70	55	−15	1.4644	.1938
	15	26	140	65	48	−17	1.4145	.2726
	16	16	112	62	67	+ 5	1.3988	.2284
	18	24	157	66	55	−11	1.3175	.1814
	32	20	135	66	50	−16	1.4735	.2798
	33	13	56	61	50	−11	1.4071	.2335
	35	7	40	115	118	+ 3	1.5350	.1693
	36	9	48	70	54	−16	1.4185	.2308
	38	5	24	68	59	− 9	1.4226	.2528
	40	4	24	58	50	− 8	1.3571	.1908
	41	8	48	75	67	− 8	1.4085	.2350
	5	28	216	60	55	− 5	.....	.....
	11	14	104	68	58	−10	.....	.....
Average	.....	13	84	68	59	− 9	1.404	.2270
Pathological average	.....	15	95	54	48	− 6	1.348	.217
Normal average	.....	.....	.....	54	.....	.....	1.484	.40

[1] Total cases, 16.

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TABLE 16.—*Half-grown albino rats, 58 days old at beginning of experiment; chloroformed after 33 days' feeding. (Laboratory No. 32.)*

Case No.	No. of animal.	Number of days fed.	Total amount food eaten in grams.	Initial body weight in grams.	Final body weight in grams.	Loss in body weight in grams.	Weight of brain.	Weight of cord.
R. V.								
Lots IX and X [1]	1	33	92	74	56	−18	.....	.....
	2	33	208	66	69	+ 3	.....	.....
	6	33	208	68	60	− 8	.....	.....
	8	33	192	51	50	− 1	.....	.....
	9	33	216	53	62	+ 9	.....	.....
	12	33	216	52	58	+ 6	.....	.....
	13	33	200	75	65	−10	.....	.....
	17	33	208	68	68	± 0	.....	.....
	19	33	192	78	56	−22	.....	.....
	20	33	232	104	93	−11	.....	.....
	21	33	168	79	72	− 7	.....	.....
	10	33	184	60	54	− 6	.....	.....
	22	33	200	95	78	−17	.....	.....
	23	33	224	81	62	−19	.....	.....
	24	33	184	72	68	− 4	.....	.....
	25	33	192	68	57	−11	.....	.....
	26	33	216	62	53	− 9	.....	.....
	27	33	184	67	52	−15	.....	.....
	28	33	168	62	54	− 8	.....	.....
	29	33	160	60	57	− 3	.....	.....
	30	33	192	68	64	− 4	.....	.....
	31	33	144	65	50	− 5	.....	.....
	34	33	180	80	67	−13	.....	.....
	37	33	192	70	55	−15	.....	.....
	39	33	168	63	52	−11	.....	.....
Average	.....	33	.....	.....	.....	.....	.....	.....
Pathological average	.....	33	188	69	61	8	1.340	0.22
Normal average	.....	.....	.....	69	.....	.....	1.568	0.48

[1] Total cases, 25.

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TABLE 17.—*Albino rats—Loss in body, brain, and spinal cord weight as result of exclusive diet of corn-oil cake.*

Case No.	Number of animals.	Age in days[1] corrected for normal body weight.	Number of days fed.	Total amount of food eaten.	Initial body weight.	Final body weight.	Percentage variation from normal.	Weight of brain in grams (found).	Weight of normal brain (calculated from formula).	Percentage variation from normal.	Weight of spinal cord (found).	Weight of normal spinal cord (calculated from formula).	Percentage variation from normal.
R. I.													
Lot I ($CHCl_3$)	4	78	35	294.5	121	111	−34	1.583	1.720	− 8	0.391	0.55	−29
Lot II ($CHCl_3$)	4	122	35	306.5	177	155	−25	1.564	1.821	−14	.382	.59	−35
Lot III ($CHCl_3$)	2	95	27	234	147	123	−30	1.507	1.772	−15	.372	.56	−34
R. IV.													
Lot IV ($CHCl_3$)	5	87	37	275	136	122	−31	1.588	1.752	− 9	.298	.55	−45
Lot V ($CHCl_3$)	7	96	37	270	149	90	−52	1.414	1.776	−20	.328	.57	−42
Average	22	96	35	279	139	116	−34	1.520	1.774	−13	.347	.56	−37
R. V.													
Lots IX and X ($CHCl_3$)	35	58	33	188	69	61	−50	1.340	1.568	−14	.220	.48	−54
R. III.													
Lot X (died)	16	53	13	84	68	59	−38	1.404	1.563	−10	.237	.43	−44
Lot IX (died)	16	40	18	106	40	37	−52	1.293	1.405	− 7	.188	.38	−47
Average	32	46	15	95	54	48	−45	1.348	1.484	− 8	.212	.40	−45
R. II.													
Lot VI (died)	7	35	26	135	35	30.5	−51	1.251	1.362	− 8	.214	.40	−47
Lot VII (died)	6	48	33	178	56	43.4	−65	1.250	1.508	−16	.216	.49	−55
Average	13	41	30	156	45	37	−58	1.250	1.435	−12	.215	.45	−51

[1] The approximate age of the animals was calculated from the body weight by means of the normal growth curve of the albino rat.

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TABLE 18.—*Albino rat—Encephalon—Relative proportions of constituents in per cent of solids.*

Case No.	Age in days.	Weight of fresh encephalon.	Content of water in (per cent).	Content of solids in (per cent).	Colloids.						Crystalloids—Extractives—Total organic extractives and inorganic constituents.
					Lipoids.					Proteins.	
					Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
Normal	131	1.774	78.20	21.80	21.8	8.0	(1)	6.60	41.70	48.50	9.80
R. I and IV ($CHCl_3$)	131	1.520	77.79	22.21	25.2	(6.62)	6.79	5.73	44.43	48.79	6.78
Percentage variation from normal		−13	±0	+1	+16	−17		−13	+6	±0	−30
Normal	91	1.570	79.0	21.0	21.8	7.80		6.50	39.70	48.50	11.80
R. V ($CHCl_3$)	91	1.340	77.7	22.7	25.90	7.90	3.60	5.65	41.80	48.94	9.26
Percentage variation from normal		−14	−1	+8	+18	± 0		−13	+5	±0	−21
Normal	71	1.435	79.1	20.9	21.80	7.2		6.50	38.7	48.5	12.8
R. II (died)	71	1.250	79.3	20.7	23.77		3.55	4.33	40.97	47.83	11.2
Percentage variation from normal		−12	±0	±0	+ 9				+5	−1	−12
Normal	62	1.484	79.20	20.80	21.80	6.5		6.50	38.00	48.50	13.5
R. III (died)	62	1.348	78.87	21.13	25.27	9.1	7.08	6.02	39.95	46.78	13.27
Percentage variation from normal		−8	±0	+1	+16	+ 4		− 7	+5	−3	− 1

[1] No figures for sulphatide in normal albino rat are available for comparison, as the method used for the sulphur determination in the earlier work gave lower results.

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TABLE 19.—*Albino rat, encephalon—Distribution of sulphur*[1] *and phosphorus in per cent of total sulphur and total phosphorus.*

Case No.	Age in days.	Sulphur.					Phosphorus.			
		Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.
Normal	131	63.8	13.80	18.50	6.90	0.56	7.00	65.00	28.00	1.42
R. I and R. IV ($CHCl_3$)	131	72.10	15.92	8.73	3.26	.85	7.66	64.98	27.42	1.50
Percentage variation from normal		+13	+15	−52	−52	+ 5	+ 9	+ 0	− 2	+5
Normal	91	63.80	11.80	18.80	7.90	.56	7.90	61.80	30.20	1.48
R. V ($CHCl_3$)	91	57.93	18.97	13.49	9.61	.66	13.26	67.20	19.50	1.49
Percentage variation from normal		− 9	+60	−29	+21	+18	+68	+ 8	−35	+0
Normal	71	63.80	10.50	18.50	8.0	.55	8.00	59.8	31.8	1.50
R. II (died)	71	72.78	13.27	13.94	.....	.71	11.11	62.6	26.3	1.47
Percentage variation from normal		+14	+26	−24	.....	+29	+39	+ 4	−17	− 2
Normal	62	63.8	10.0	18.20	8.0	.55	8.00	59.0	32.00	1.51
R. III (died)	62	60.53	19.95	10.80	8.72	.70	8.06	64.5	27.4	1.52
Percentage variation from normal		− 5	+99	−40	+9	+23	+ 0	+ 9	−14	+ 0

[1] The figures of the sulphur distribution in the normal can not be compared with the pathological material, as the former were obtained by a method yielding lower results.

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TABLE 20.—*Albino rat, spinal cord—Relative proportions of constituents in per cent of solids.*

Case No.	Age in days.	Weight of fresh spinal cord.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids—Extractives—Total organic extractives and inorganic constituents.
					Lipoids.					Proteins.	
					Phosphatides.	Cerebrosides.[1]	Sulphatides.	Cholesterol.	Total lipoids.		
Normal	120	0.56	72.9	27.1	28.88	8.92	([2])	14.8	59.6	32.8	7.6
R. I and IV ($CHCl_3$)	131	.35	71.03	28.97	29.40	9.02	9.99	13.1	61.5	31.1	7.3
Normal	91	.48									
R. V ($CHCl_3$)	91	.22	71.08	28.92	31.14	6.25	11.68	13.05	62.11	31.34	6.55
Normal	66	.40									
R. II and III (died)	66	.21	71.84	28.16	27.68	7.39	8.71	12.60	56.38	36.67	6.95

[1] Obtained by difference.
[2] No figures for sulphatide in normal albino rat are available for comparison as the method used for the sulphur determination in the earlier work gave lower results.

TABLE 21.—*Albino rat, spinal cord—Distribution of sulphur and phosphorus in per cent of total sulphur and total phosphorus.*

Case No.	Age in days.	Sulphur.					Phosphorus.			
		Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extract.	Total.
Normal ($CHCl_3$)	120	53.70	30.90	10.3	5.1	([1])	5.6	77.40	17.0	1.44
R. I and IV ($CHCl_3$)	131	48.60	35.55	10.2	5.7	0.56	11.66	79.14	9.2	1.44
R. V ($CHCl_3$)	91	51.00	34.44	(14.56)		0.68	10.65	77.62	11.73	1.56
R. II and III (died)	66	47.20	34.20	11.80	6.8	0.51	17.26	78.68	4.16	1.365

[1] No figures for sulphatide in normal albino rat are available for comparison, as the method used for the sulphur determination in the earlier work gave lower results.

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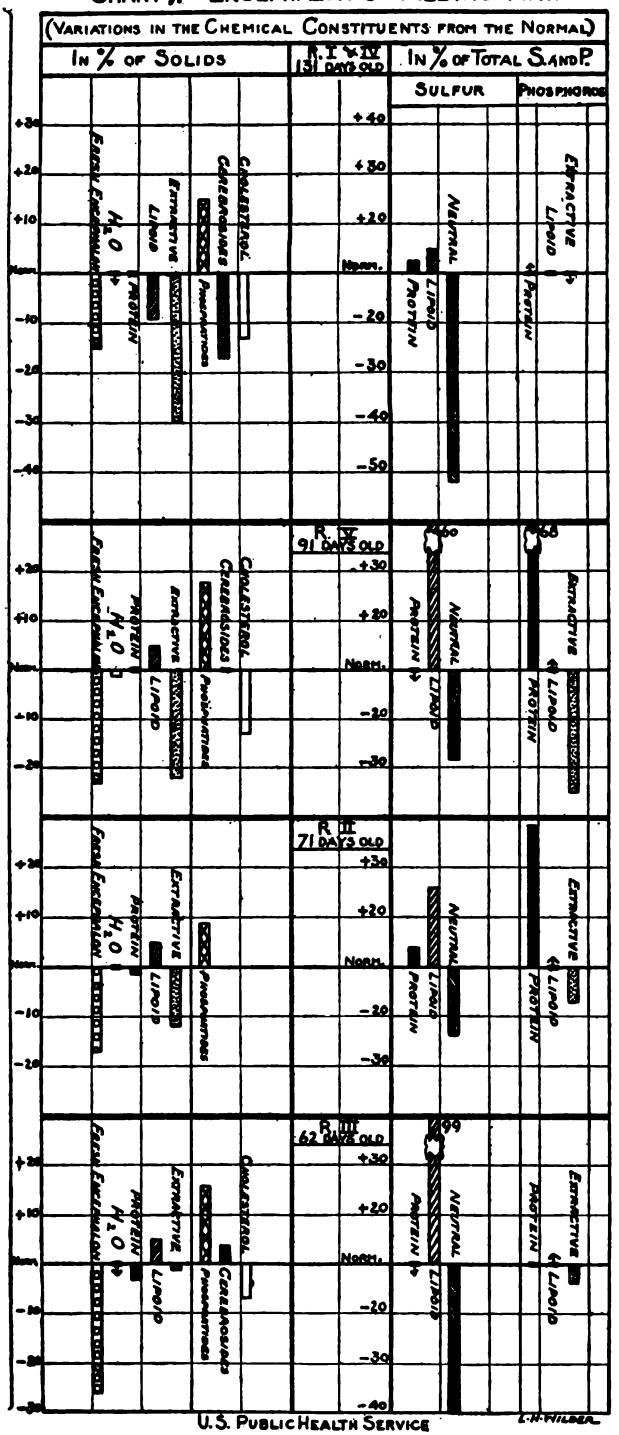
CHART 7.—ENCEPHALON OF ALBINO RAT.



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HISTORIES OF MONKEYS.

MONKEY M. I.

Diet: Corn-oil cake, 100 gm. daily. Began feeding Mar. 14, 1914. Body weight, 3.1 kilos.

Date.	Body weight.	Remarks.
Mar. 21	2.84	
Mar. 27	2.66	Intense diarrhea.
Apr. 3		Do.
Apr. 11	2.48	Do.
Apr. 18	2.43	Looks depressed. Very weak.
Apr. 22		Exposed to sunlight for 3 hours.
Apr. 24		Is coughing.
Apr. 25	2.42	Diarrhea still presists.
Apr. 27		Exposed to sunlight for 3 hours.
May 2	2.30	
May 6–7		Exposed to sunlight for 3 hours. Blood vessels of ears are greatly dilated.
May 9	2.33	Diarrhea persists.
May 11		Exposed to sunlight for 6 hours.
May 12		Exposed to sunlight for 3 hours.
May 15	2.28	Tongue coated, otherwise normal. Exposed to sunlight for 3 hours.
May 19		Exposed to sunlight for 3 hours.
May 20		Diarrhea persists.
May 20		Two erythematous spots in region of external canthus. Nose shows erythematous spots. Animal rubs nose with hands as if irritated. Exposed to sunlight for 1 hour. Coughs.
May 21	2.09	9 a. m., redness has much increased since yesterday. Coughing; intense diarrhea. Died at 1.30 p. m. while exposed to sunlight.

NECROPSY (2.30 P. M.).

Body emaciated; central nervous system normal; liver pale; kidneys pale; stomach slightly hemorrhagic; intestine slightly hemorrhagic; 79 grams of liver preserved in 95 per cent alcohol; 9 c. c. bile removed from intact gall bladder; section in Zenker's and 10 per cent formalin from liver, lungs, adrenal, spleen, heart, kidney, cord (cervical), brain (vertical cross section in optic nerve region), stomach, small intestine, large intestine, and skin of external canthus where redness was observed before death.

This animal had an intense diarrhea lasting for a long time; showed depression and had developed a cough two days previous to death; had red spots on face.

MICROSCOPIC APPEARANCE.

Heart.—Mycoardium, muscle fibers are much separated; in many areas the transverse striations are not so distinct as normal; no pigmentation is observed, nor is the sarcoplasm granular; a slight degree of congestion is present in both the larger vesels and the intermuscular capillaries.

Lungs.—The aveoli walls are markedly congested and in some alveoli there are indications that hemorrhages have occurred; the larger vessels are congested and the surrounding lymphatics contain much blackish pigment, probably foreign.

Liver.—Marked changes have occurred in the liver; it is only after some study that one is convinced that the section is taken from the liver; both the portal and central veins are congested, and in the former large cells (phagocytes?) are seen filled with dark brown pigment; the intralobular capillaries are congested as a rule. The pronounced changes are seen in the liver cells: the typical cords are not seen, but the cells lie scattered without definite arrangement; some are atrophic, others are large; all types of forms are seen—

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some angular, others round or oval, and still others irregular in outline. The cytoplasm of many cells are vacuolated (hydrops), in many instances the vacuoles are larger than the nuclei; these vacuoles vary in size and number for each cell; they are found in cells near the central vein as well as in the peripheral portions of the lobules. These vacuoles are not the typical vacuoles of fatty degeneration. In many cells the cytoplasm is granular. In many instances the cells normally present surrounding the central veins have disappeared, only a few remain. This section shows pronounced nutritional disturbances. No evidence of infection is observed.

The description above does not apply to all portions of the liver, as sections were examined where the cells and cords are more normal in appearance. In these cases the disturbances have not been so pronounced.

Spleen.—Capsule is thickened; a marked congestion of the spleen pulp is seen; no abnormal accumulation of polymorphonuclears are seen in the pulp; the red blood-cells completely surround and break up the pulp cords so that the latter appear as small irregular islets in the red blood-cells; the lymphoid tissue surrounding the arteries—Malphighian areas—are reduced in amount. There is also seen a beginning amyloidosis in these areas; however, they react only faintly to methyl violet.

Kidney.—Capsule appears normal; glomeruli for the most part are congested; cells of proximal convoluted tubules are slightly granular, the nuclei stain normally; the distal ends of these cells are broken and a granular ditritis is found in the lumena, this is also true of the remaining elements of the urinary tubules; the collecting tubules are similar in appearance to the urinary tubules; the interstitial vessels are congested.

Stomach—Fundus.—Superficial epithelium is eroded; this is also true of the cells deeper down in the glands where they are either completely or partially destroyed; the parietal cells stand out very plainly and appear normal, they appear to have resisted the degenerative changes; a slight increase of the cellular elements is seen in the mucosa—round cells and plasma cells—the muscularis mucosae is normal; the submucosa is slightly congested; marked atrophy of the muscular wall has occurred.

Small intestine—Ileum(?).—Superficial epithelium is eroded; the naked villi project into the lumen, many of which are congested and hemorrhagic; numerous large plasma cells are seen in these naked and eroded villi; in many instances the villi are completely destroyed, ulcers; the goblet cells stain deeply in muchaematein and are well preserved where the epithelium remains intact; the submucosa is atrophic and slightly congested; the muscular coat is very thin.

Colon.—Superficial epithelium is eroded; the goblet cells are well preserved; the interstitial cells of the mucosa are atrophic, a mild congestion is seen in certain areas, no hemorrhage; the submucosa is slightly congested.

Cerebrum.—A mild congestion of both cortex and pia is noted. No other section from nervous system was examined.

Skin.—From region of external canthus; no noticeable changes in various epithelial layers; the connective tissue fibers of dermis and subcutaneous portions are separated—suggesting edema at one time—no congestion; no pigmentation.

SUMMARY.

Gross conditions.—Extreme emaciation; congestion and hemorrhage of gastrointestinal tract and nutritional disturbance in liver and kidney—both large and pale.

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Microscopic anatomy.—Congestion of heart and lungs, marked disturbance of liver cells—atrophic, vacuolated, cells irregularly distributed—spleen extremely congested with beginning amyloidosis of the Malphighian bodies; kidney, slight congestion of all vessels and beginning albuminous degeneration; gastrointestinal tract congested and hemorrhagic.

MONKEY M. II.

Diet: Corn-oil cake No. 2 (Indianapolis), 100 grams daily. Began feeding Mar. 20, 1914. Body weight, 3.68 kilos.

Date.	Body weight.	Remarks.
Mar. 20	.....	Animal has diarrhea.
Mar. 21	3.3	Do.
Mar. 27	3.32	
Apr. 2	3.12	Do.
Apr. 3	3.07	Do.
Apr. 18	3.00	
Apr. 22	.....	Exposed to sunlight for 3 hours.
Apr. 24	.....	Diarrhea continues.
Apr. 25	3.05	Do.
Apr. 27	.....	Exposed to sunlight for 3 hours.
May 2	3.00	Diarrhea continues.
May 7	.....	Exposed to sunlight for 3 hours.
May 9	2.92	Diarrhea continues.
May 11	.....	Exposed to sunlight for 6 hours.
May 14	.....	1 hard-boiled egg added to diet.
May 15	2.89	Do.
May 16	.....	Diarrhea; tongue and gums normal.
May 19–21	.....	Exposed to sunlight every day.
May 23	2.66	Diarrhea continues.
May 26	2.40	Edema of upper right eyelid.
May 31	.....	Subcutanous hemorrhage on upper right eyelid. Is very weak and looks depressed. Exposed to sunlight for 30 minutes.
June 4	.....	Abnormal redness of gums.
June 6	.....	Animal unable to walk. Intense diarrhea. Died at 3 p. m.

NECROPSY.

Very emaciated body. Weight, 2,150 grams. Brain and cord removed and vertical sections taken of cerebrum near optic nerve, one in each hemisphere; 2 sections of cord near first lumbar vertebra. Lungs normal; liver normal, 58 grams, 1.8 c. c. of pale bile collected from gall bladder. Spleen dark red. Pancreas hemorrhagic. Kidneys pale. Adrenal normal. Stomach mucosa shows small profuse hemorrhages. Small intestine has thin wall, which tears easily, is slightly hemorrhagic. Large intestine shows profuse hemorrhages. The whole gastrointestinal canal is practically empty.

MICROSCOPIC FINDINGS.

Heart.—Myocardium, the muscle fibers were granular in appearance; cloudy swelling; much pigment is in evidence, but this pigment is not the typical pigment of brown atrophy. It is more or less diffuse throughout the cell, and in many instances it is difficult to distinguish from the granular cytoplasm. The transverse striations are indistinct; many blood cells are seen between the fibers, a mild degree of congestion.

Lungs.—This particular section shows much congestion of the alveolar capillaries, and the alveolar walls are thickened; much greenish-brown pigment is also seen in these thickened walls and around the larger vessels and bronchi; no leucocytic infiltrations are observed; small areas of lymphoid cells are seen near the bronchi in some instances; these can not be considered as abnormal, however.

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Liver.—For the most part appears normal; slight congestion is also seen in both the central and portal veins, many blood cells are also observed in the intercellular capillaries; the cytoplasm of the cord cells appear somewhat cloudy and not distinct as in the normal; the nuclei are vesicular; one very small focus of polymorphonuclear leucocytes is observed.

Spleen.—This organ shows pronounced pathological changes; the capsule is thickened; the entire spleen pulp is congested and hemorrhagic—in fact, the red-blood cells practically obscure the pulp cells—the larger vessels are intensely congested; all the malpighian areas are undergoing amyloidosis; in some practically all the lymphoid cells are masked by amyloid which stains violet red in gentian violet; Van Giesens stain shows hyaline changes in many of the central arteries.

Kidney.—Capsule is congested and torn away from the parenchyma; the stellate veins are also congested, the glomeruli for the most part are congested; the cells of the urinary tubules, especially convoluted tubules, are swollen; the cytoplasm is granular; a granular detritus fills many of these tubules, which stain red in eosin; the intertubular vessels in many instances are slightly congested. Sections from other portions of kidneys show great dilatation of both the collecting and urinary tubules.

Suprarenal.—Very few changes are observed in this organ; the cytoplasm is more reticulated than normal, especially in the zona fasiculata, which may indicate an increase of lipoids.

Hemolymph gland.—Capillaries and sinuses are intensely congested and contain much brown pigment.

Stomach.—Pyloric region, epithelium intact and normal throughout, the mucosa is congested, especially in that region surrounding the fundi of glands; the muscularis mucosa is not well differentiated from the submucosa; the latter, in certain places, is somewhat congested; the muscular layer appears normal; no parietal cells are seen.

Small intestine—upper part—jejunum.—Surface epithelium is broken; the mucosa is congested and hemorrhagic; in many instances these hemorrhagic areas come in contact with lumen; no leucocytic infiltration is observed in the mucosa, the mucosa in this section has become separated from the muscularis mucosa; the latter appears normal; the submucosa is torn and broken, some of its vessels are congested and in certain areas red-blood cells are seen loose in the surrounding tissue; the muscular layer appears normal.

Small intestine—ileum.—The surface epithelium is broken, especially on the ends of the villi, in which instance the mucosa comes in contact with the lumen; the mucosa is injected and hemorrhagic and there is also an increase of the cellular elements—chiefly small lymphoid cells, although polymorphonuclear leucocytes and plasma cells are both abundantly seen; the goblet cells stain deeply in muchaematein; the muscularis mucosa is distinct; the submucosa is loose and many of its vessels are congested; a pronounced atrophy has occurred in the muscular layer, both layers are not more than one-half the thickness of normal. In many of these sections such changes have occurred in the epithelium and villi that it was was found essential to use differential stains in order to determine the true nature of the tissues.

Nervous system.—Sections from tissue removed from cerebrum near optic nerve were prepared by the Pal-Weigert method and counterstained in lithium carmin. No abnormalities are observed in the cells of the cortex, no degenerations are seen in the fibers leading from the cortex; the pia appears normal; the spinal cord—lower dorsal region—shows a diffuse degeneration of the myelin sheaths. The degeneration is not limited to any particular tract. Degenera-

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tions occur in the following regions: Anterior pyramidal, anterior and lateral margins of the anterior and lateral tracts, and a diffuse, ill-defined area in the posterior tract in both Goll's and Burdach's column. As stated, these degenerated fibers are not demarcated from the normal. The section gives the appearance macroscopically of a diffuse light band surrounding a darker zone of more normal fibers. The vessels in the gray matter are congested; some cells in the anterior horn were large and pale although complete chromatolysis had not taken place; the other cells of the gray matter for the most part appear normal.

SUMMARY—POSITIVE FINDINGS.

Gross findings.—Very emaciated body, spleen dark congested; pancreas hemorrhagic; kidneys pale; stomach, small intestines, and large intestines hemorrhagic; small intestinal wall thin and atrophic.

Microspocic findings.—Heart muscle granular and pigmented; lungs, congested and pigmented; liver, slightly congested; spleen, intensely congested and has undergone amyloidosis; kidney, congested and a mild degree of albuminous degeneration; the lower intestinal tract hemorrhagic, congested and atrophic; spinal cord, degenerative changes in all tracts.

MONKEY M. III.

Diet: Equal parts of corn meal and sweet potatoes (cakes). Began feeding May 5, 1914. Body weight, 2.5 kilos.

Date.	Body weight.	Remarks.
May 9	2.32	
May 11		Exposed to sun for 6¼ hours.
May 12		Exposed to sun for 3 hours.
May 15		Do.
May 16		Diarrhea.
May 19		Exposed to sunlight for 3 hours.
May 20		Exposed to sunlight for 1 hour.
May 21		Exposed to sunlight for 2½ hours.
May 22		Exposed to sunlight for 1½ hours.
May 23	2.38	
May 29	2.42	
June 5		Exposed to sunlight for ½ hour.
June 6	2.39	
June 13	2.39	
June 19	2.28	
June 26	1.87	Exposed to sunlight for 15 minutes.
June 27	1.86	Had been well up to to-day. Is sick now. Can not be aroused from lying position. Marked stupor. Dies at 9 p. m.

NECROPSY.

Very emaciated body. Lungs normal. Heart flabby, in diastole. Liver congested. Stomach and intestines show diffuse hemorrhages. Spleen congested. No signs of scurvy. Large intestine contains a few round worms.

MICROSCOPIC FINDINGS.

Degeneration of myocardium; congestion of liver; spleen congested with hyaline changes. Kidney cytoplasmic disturbances, degeneration of urinary and collecting tubules. Stomach superficial erosions; intestines ulcerative hemorrhages and congestion.

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MONKEY M. IV.

Diet: Yellow corn meal (cakes). Began feeding May 5, 1914. Body weight, 2.27 kilos.

Date.	Body weight.	Remarks.
May 5	2.27	
May 11		Exposed to sunlight for 6½ hours.
May 12		Exposed to sunlight for 3 hours.
May 15	2.18	Do.
May 19		Do.
May 20		Exposed to sunlight for 1 hour.
May 21		Exposed to sunlight for 2½ hours.
May 22		Exposed to sunlight for 1½ hours.
May 23	2.12	
May 29	2.07	
June 5		Exposed to sunlight for ½ hour.
June 6	2.15	
June 13	2.04	
June 19	1.95	
June 25		Animal has sick appearance and diarrhea.
June 26	1.73	Exposed to sunlight for 15 minutes. Lies down most of the time. Looks depressed.
June 27		Can not be aroused from stupor.
June 28		Dies at 1.45 p. m.

NECROPSY.

Very emaciated body. Lungs normal. Heart in diastole. Liver congested. Stomach and intestines slightly hemorrhagic. Spleen congested. A few small worms are found in intestines. No signs of scurvy.

MICROSCOPIC APPEARANCES.

Heart.—Myocardium; in certain areas, especially those fibers near the endocardium, show vacuolization (hydrops) and numerous albuminous granules; the vacuoles surround the nuclei for the most part; the transverse striations are either faintly seen or absent in most of the myocardial fibers. As no fat or necrotic areas are seen, perhaps too much pathological significance should not be placed on this picture. All vessels including the myocardial capillaries are congested.

Lungs.—Few changes are seen in the lungs; the alveolar walls are thickened; the peribrochial and perivascular connective tissue contain much brownish, yellow pigment; this pigment is also seen here and there in the alveolar walls; where blood is present in the larger vessels pigment of the same color is seen in either diffuse or in certain cells; only a part of the pigment gives the hemosiderin reaction with potassium ferrocyanide and hydrochloric acid. The largest amount is in all probability hemoglobin precipitated by the formalin used in fixation.

Liver.—This organ is intensely congested, both central veins and the portal veins; the blood contains very much pigment, but as these tissues were fixed in formalin perhaps no pathological significance can be attached to it; the liver capillaries are also congested, and as a result the cord cells are thinned and separated from each other; the cords are distorted; the cells nearest to the central veins are most affected; many lobules give characteristic appearance of nutmeg liver.

Spleen.—Intensely congested, the pulp cells are masked by this congestion, and the characteristic pigment is seen as described above, which is either within the endothelial leucocytes as granules or free; the spleen is atrophic, as more than

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the usual number of Malpighian areas are seen; in many of these hyalin changes have occurred in the central arteries; there is also an increase of the connective tissue elements throughout.

Kidney.—Capsule, congested; glomeruli are either normal in appearance or congested; the urinary tubules, especially the convoluted tubules, show disturbances of the cytoplasmic elements of the cells; in the cytoplasm are seen vacuoles or reticulations; the ends of the cells forming the lumena are broken and ragged, albuminous granules are also seen; the lumena are wide—both from dilatation and as a consequence of the destruction of the proximal ends of the cells—ahe cells of the other constituents of both the urinary and collecting tubules show similar changes; considerable congestion is seen in all vessels, the blood which contains much pigment-hemoglobin.

Suprarenals.—Congestion and hemorrhage are seen in both the medulla and cortex, with the characteristic pigment; the medulla is atrophic.

Stomach—fundus.—Mucosa congested; parietal cells in many instances are broken and atrophic; this is also true of the other cells of the fundi of the glands; the mucosa muscularis is normal; the submucosa is congested; the muscular layers appear normal.

Small intestine—ileum.—In many instances the villi are eroded, some completely gone, others more than one-half of their lengths; the submucosa is greatly infiltrated with lymph, plasma, and endothelial cells; few leucocytes are also seen; these cell infiltrations come in contact with the lumen ulcers; the submucosa is congested; the muscular layer is atrophic, the fibers of the inner layer are broken and separated from each other.

Large intestine.—Mucosa much similar to that described for small intestine; more polymorpholeucocytes, however, are seen in the mucosa, and in some instances these form small foci; submucosa and muscular layer are normal.

Central nervous system.—A mild congestion of the meninges is seen; this is also true of the cerebral cortex; no changes are observed in the pyramidal cells except that spaces are seen between many cells and the surrounding neuroglia. This, however, may be due to the fixative. Pal-Weigert's method shows little or no degeneration of nerve tracts from this section of the cortex (frontal lobe). Spinal cord, dorsal region, a small area of degenerated fibers is observed macroscopically in the median line of the posterior tract; this area is included within the column of Goll; however, not all the fibers within this area are degenerated; many of the cells of the anterior horn appear swollen and pale, the Nissl's bodies being reduced; the central canal is dilated and filled with a granular detritus.

SUMMARY.

Gross findings.—Extreme emaciation; congestion of liver and spleen; congestion and hemorrhage of the gastrointestinal tract.

Microscopic findings.—Degeneration of myocardium; liver extremely congested; spleen, congested and hyaline changes; kidney, mild degree of albuminous degeneration; suprarenals, slightly congested; stomach, congestion and erosion of epithelium; small and large intestines, congestion of both mucosa and submucosa, with erosion of villi and ulcers, with atrophy of the muscular layers of the ileum especially; nervous system, degeneration of fibers in the tract of Goll.

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MONKEY M. V.

Diet: Yellow corn meal (cakes). Began feeding May 5, 1914 Body weight, 2.8 kilos.

Date.	Body weight.	Remarks.
May 9	2.73	
May 11		Exposed to sunlight for 6½ hours.
May 12		Exposed to sunlight for 3½ hours.
May 15	2.61	Exposed to sunlight for 3 hours.
May 19		Do.
May 20		Exposed to sunlight for 1 hour.
May 21		Exposed to sunlight for 2½ hours.
May 22		Exposed to sunlight for 1½ hours.
May 23	2.56	
May 29	2.56	
June 5		Exposed to sunlight for ½ hour.
June 6	2.5	
June 13	2.49	
June 19	2.38	
June 25		In good condition. Lively.
June 26	2.21	Exposed to sunlight for 15 minutes.
June 28		Appears sick. Lies on floor. Difficult to arouse.
June 29		Depressed. Exposed to sunlight for 1 hour.
June 30		8 a. m., in dying condition; 9 a. m., dead.

NECROPSY.

Heart flabby; liver dark red, congested. Kidneys pale. Adrenals show marked congestion. Stomach and upper intestine hemorrhagic; especially was this true of the lower jejunum and colon.

MICROSCOPIC APPEARANCES.

Heart.—Ventricular wall, marked congestion of all blood vesels; transverse striations are not so definite as seen in the normal; longitudinal striations are normal in appearance; Van Giesen's stains show a general increase of collagenic fibers.

Liver.—Marked congestion of both the central and portal veins is seen; the chains of liver cords are broken up into irregular, interrupted chains, some even forming little islets of liver cells—this condition is chiefly due to congestion of capillaries—the cytoplasm of the liver cells is granular; the nuclei as a rule stain more faintly than normal; no pigmentation or fatty degeneration is seen.

Spleen.—The entire pulp is filled with red blood cells; Malpighian corpuscles are reduced in areas as a result of this intense congestion; this is a typical picture of passive congestion.

Pancreas.—Marked congestion of all blood vessels; many islets are very indistinct and difficult to make out from the surrounding acini, as no sharp line of demarcation exists between them. The acini are also congested.

Kidney.—The capsule is congested, loose, and in practically all the sections it is torn and separated from the cortex; the glomeruli as a rule are of normal size, many possess numerous red blood cells—showing a slight stage of congestion. The convoluted tubules are in many instances granular, some show hydrops wherein the entire cells are enlarged and vacuolated; the nuclei as a rule, with the exception of those vacuolated, are normal in their staining reactions. The remaining elements of the renal and collecting tubules are apparently normal. The lumena of the latter in many instances contain a

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granular detritus. There is a general presence of red blood cells in all the vascular elements, indicating a slight degree of congestion.

Certain focal areas are seen wherein the cytoplasm is broken, stains faintly, and the nuclei fail to stain. These areas may include both glomeruli and tubules—areas of focal necrosis. The presence of these focal necrotic areas, mild congestion, and the granular condition of the proximal tubules certainly indicate a mild toxic disturbance of the kidney.

Suprarenal.—The capsule is congested; marked congestion and hemorrhage is seen in the cortical substance, especially in the zona fasiculata; the cells of this zone are much more vacuolated than in the normal, showing an increase of lipoid substances; much pigment is seen in the terminal cells of the zona reticularis—this, however, can not be considered as abnormal in amount. The sinuses of the medullary portion are filled with red blood cells; no alterations appear in the chromoffin cells.

The marked lesions here are the hemorrhages and congestions seen in the zona fasiculata; the cytoplasm of these cells being very granular.

Stomach—pyloric region.—Slight congestion of the vessels of the mucosa is practically the only abnormality found. Some vessels in the submucosa and muscular layer are also congested. The epithelial cells are normal; fundus region same as pyloric.

Small intestine—ileum.—Epithelium on tips of villi eroded; remainder of epithelial cells of glands are normal; mucosa is congested and many polymorphonuclear leucocytes are seen, however, not to such an extent as is seen in the section from colon; the muscularis mucosa is in contact throughout; the submucosa is atrophic and congested; atrophy and thinning of the muscular wall is also observed.

Colon.—Superficial epithelium eroded; extreme congestion and hemorrhage of mucosa; in many instances red blood cells are seen in the lumena of the gland tubules; many polymorphonuclear leucocytes are also seen in the mucosa; these have a tendency to accumulate into foci which are in free contact with the lumen, ulcers; goblet cells stain only faintly in muchaematein.

Nervous system.—Small pieces from the following tissues were prepared for microscopic study by Pal-Weigert's method and the method for demonstrating Nissl bodies; cerebrum, fissure of Rolando, internal capsule; cerebellum, vermis; cord, cervical and lumbar enlargement; vagus nerve; sympathetic trunk with ganglia; spinal ganglion. Consequently it was possible to study both the cells and axones with their myelin sheaths.

Pronounced changes are seen in the column of Burdach in the cervical enlargement, where practically all the myelin sheaths are in stage of degeneration; this degeneration is sharply demarcated from the column of Goll. Many cells in the spinal ganglia have undergone chromatolysis; are pale; there is also seen an increase of the pericellular connective tissue elements.

SUMMARY.

Gross findings.—Moderate increase of cerebrospinal fluid, heart flabby, liver congested, kidneys pale, adrenals markedly congested, gastro-intestinal tract hemorrhagic, especially in lower part.

Microscopic findings.—Heart congested and muscles have undergone retrogressive changes; liver congested, and cells have undergone pathologic changes; spleen intensely congested; pancreas congested, with disturbances in islets of Langerhans; kidney, slight congestion, disturbance of the cells of the proximal convoluted tubules, focal necrotic areas; suprarenals intensely congested and

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hemorrhagic; gastro-intestinal tract congested, hemorrhagic, and atrophic, each increasing in degree as the lower end is approached; spinal cord, degeneration of Burdach's column.

Monkey M. VI (Control).

Diet: Bananas, eggs, sunflower seeds, carrots, Irish potatoes, and wheat bread.

Body weight, 2.89 kilos.

Killed September 16, 1914, by means of chloroform.

NECROPSY.

No pathological changes noticed. Weight of fresh brain, 81.59 grams.

Monkey M. VII.

Diet: Raw carrots. Began feeding May 23, 1914. Body weight, 2.5 kilos.

Date.	Body weight.	Remarks.
	Kilos.	
May 23	2.5	
May 29	2.4	
June 5		Exposed to sunlight for ½ hour.
June 13	2.35	
June 19	2.28	Feces soft, color of carrots.
June 26	2.30	Exposed to sunlight for 15 minutes, skin of face shows yellowish tinge.
June 28		In good condition, lively. Exposed to sunlight for 1 hour.
July 2		Diarrhea. Skin shows marked yellow tinge.
July 3	2.21	Fed sunflower seed by mistake.
July 10	2.15	
July 14		Diarrhea.
July 17	2.17	Diarrhea persists.
July 25	2.09	
Aug. 1	2.07	
Aug. 8	2.05	
Aug. 15	2.04	
Aug. 21	2.02	
Aug. 29	2.06	
Sept. 5	2.16	
Sept. 11	2.02	
Sept. 15		Diarrhea still persists.
Sept. 19	2.02	
Sept. 27	2.06	
Oct. 1		Fed bananas by mistake.
Oct. 5	1.84	
Oct. 10	1.62	
Oct. 18	1.58	
Oct. 24	1.6	
Oct. 31	1.63	
Nov. 9	1.69	Diarrhea still persists.
Nov. 12		Is weak.
Nov. 14	1.62	Found dead at 12 m.

NECROPSY.

Extremely emaciated body. Skull and spine hard. Cord and brain normal. Heart congested; no excessive fluid; no dilatation of right heart. Lung normal. Liver congested. Spleen very small, congested. Kidney congested. Pancreas normal. Abdominal lymphglands enlarged. Stomach, fundus extremely hemorrhagic. Duodenum slightly hemorrhagic. Ileum slightly hemorrhagic. Large intestine normal, contains a few worms, resembling hookworms. Teeth not loose. No muscular hemorrhages. No signs of scurvy. Marrow of femur is red.

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DISCUSSION OF RESULTS.

Various changes are noted in the brain and spinal cord of animals fed on an exclusive vegetable diet. It may be said that in general the changes observed correspond somewhat closely to those observed in pellagra. In some instances, however, a considerable difference is noted.

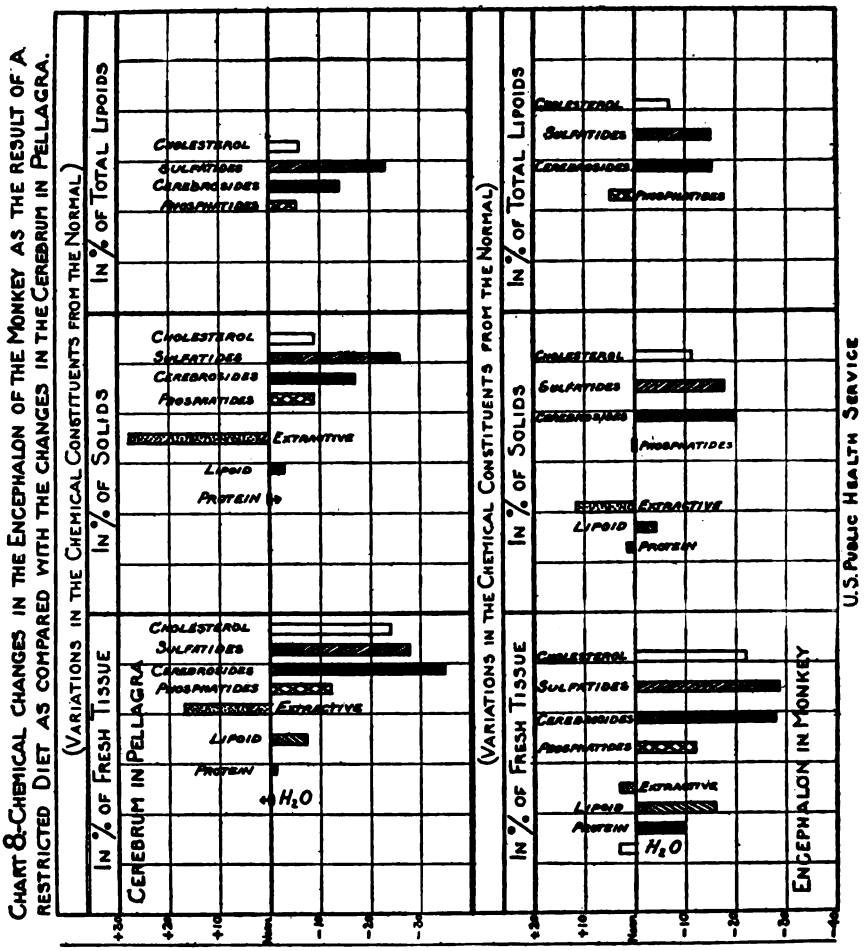
CHART 8.—CHEMICAL CHANGES IN THE ENCEPHALON OF THE MONKEY AS THE RESULT OF A RESTRICTED DIET AS COMPARED WITH THE CHANGES IN THE CEREBRUM IN PELLAGRA.
(VARIATIONS IN THE CHEMICAL CONSTITUENTS FROM THE NORMAL)
IN % OF FRESH TISSUE
IN % OF SOLIDS
IN % OF TOTAL LIPOIDS
CEREBRUM IN PELLAGRA
CHOLESTEROL
SULFATIDES
CEREBROSIDES
PHOSPHATIDES
EXTRACTIVE
LIPOID
PROTEIN
H_2O
ENCEPHALON IN MONKEY
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Charts 8 and 9 illustrate the close resemblance, if not complete identity, of the changes occurring in the cerebrum in pellagra and in the encephalon of the monkey. This similarity is much greater than could be anticipated and yields a substantial support for the assumption that pellagra is a dietary disease.

All of the animals lost considerably in body weight. Chart 10 illustrates this loss of weight in the growing albino rat. The Roman

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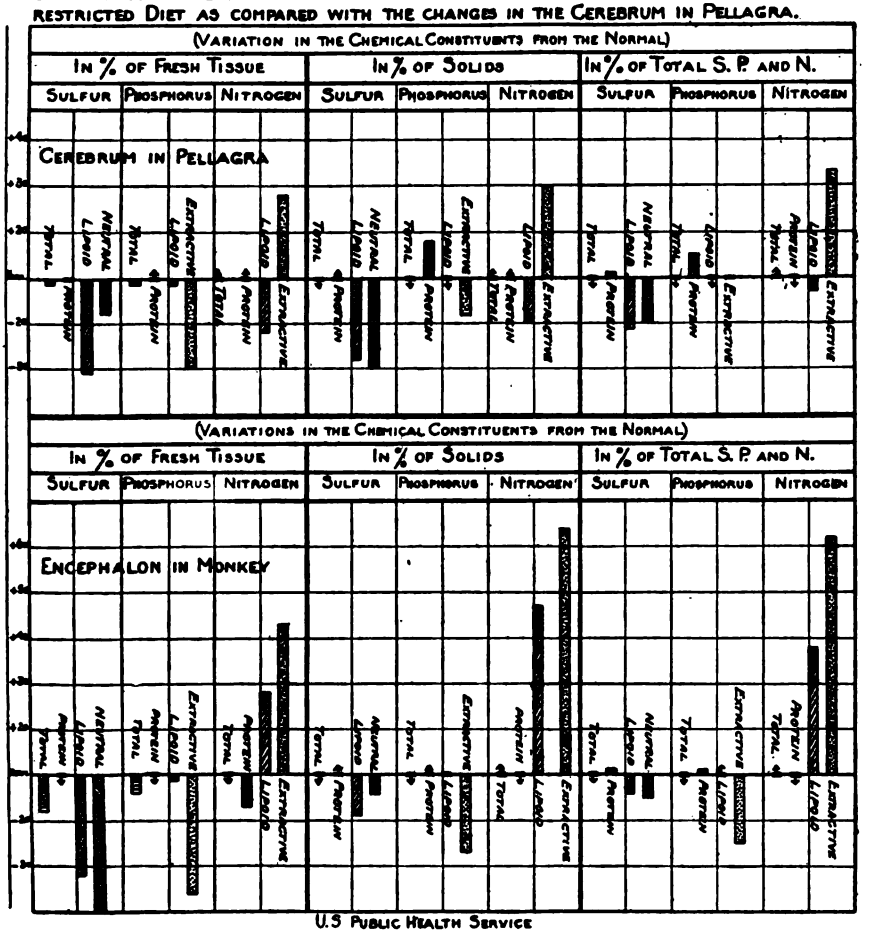
figures indicate the relative loss of body weight of a particular lot of animals as compared to the normally growing animals. There is also noted a loss of body weight under the initial weight.

Charts 11 and 12 calls attention to the fact that the weight of the brain and spinal cord as compared with the body weight reveals a considerable and constant loss in these organs.

CHART 9—CHEMICAL CHANGES IN THE ENCEPHALON OF THE MONKEY AS THE RESULT OF A RESTRICTED DIET AS COMPARED WITH THE CHANGES IN THE CEREBRUM IN PELLAGRA.



U.S PUBLIC HEALTH SERVICE

The result of an exclusive vegetable diet of the composition used in these experiments, therefore, leads to a reduction of the weight of the body, the brain, and the spinal cord. This is, we believe, the first recorded instance in which such an atrophy of the central nervous system has been produced in animals by means of a change in diet. Besides this atrophy in the whole organ, characteristic quantitative variations in the chemical constituents are observed. We believe that

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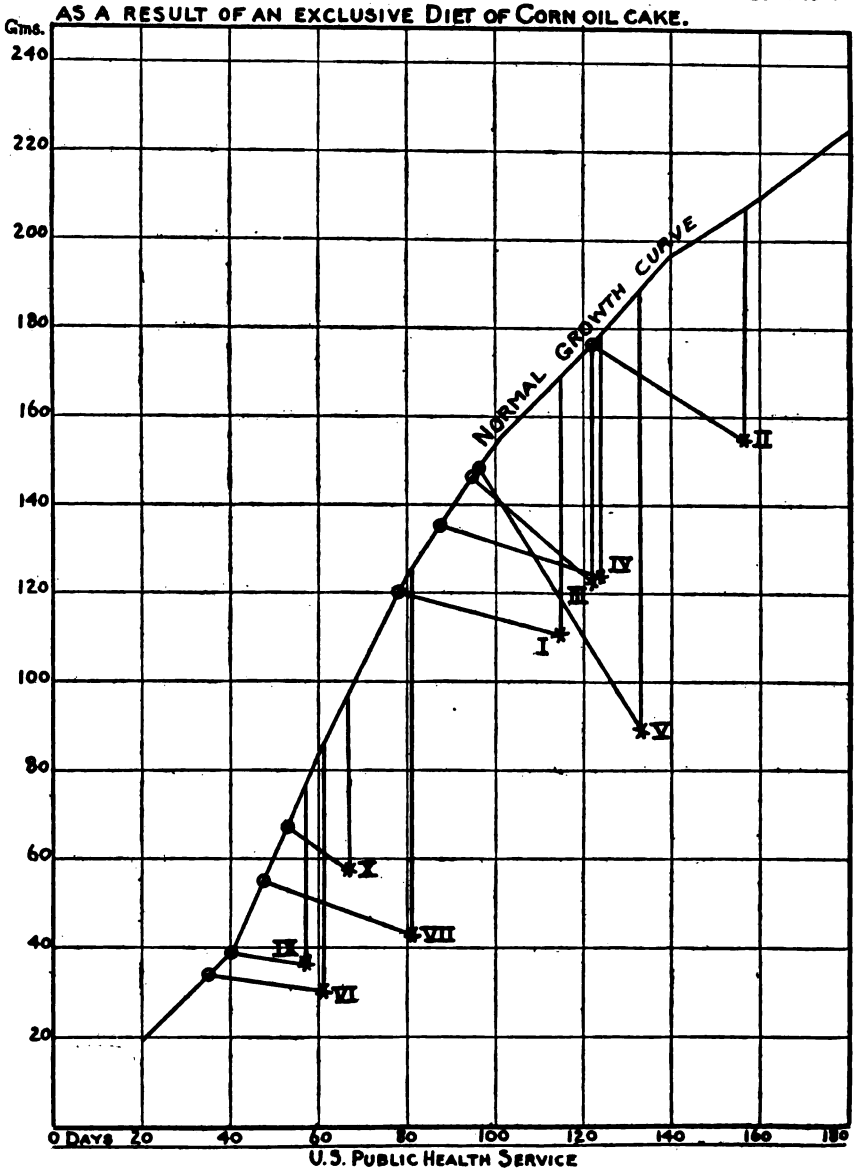
the present investigation is just the beginning of work along this line and it can, therefore, only be considered as preliminary. It is hoped that the results described will stimulate further investigations

CHART 20. ILLUSTRATING LOSS OF BODY WEIGHT OF GROWING ALBINO RAT AS A RESULT OF AN EXCLUSIVE DIET OF CORN OIL CAKE.



in this very interesting field. It is difficult to estimate the influence which such researches may have on the future development of psychiatry and neurology. It may suffice to say that it is quite possible

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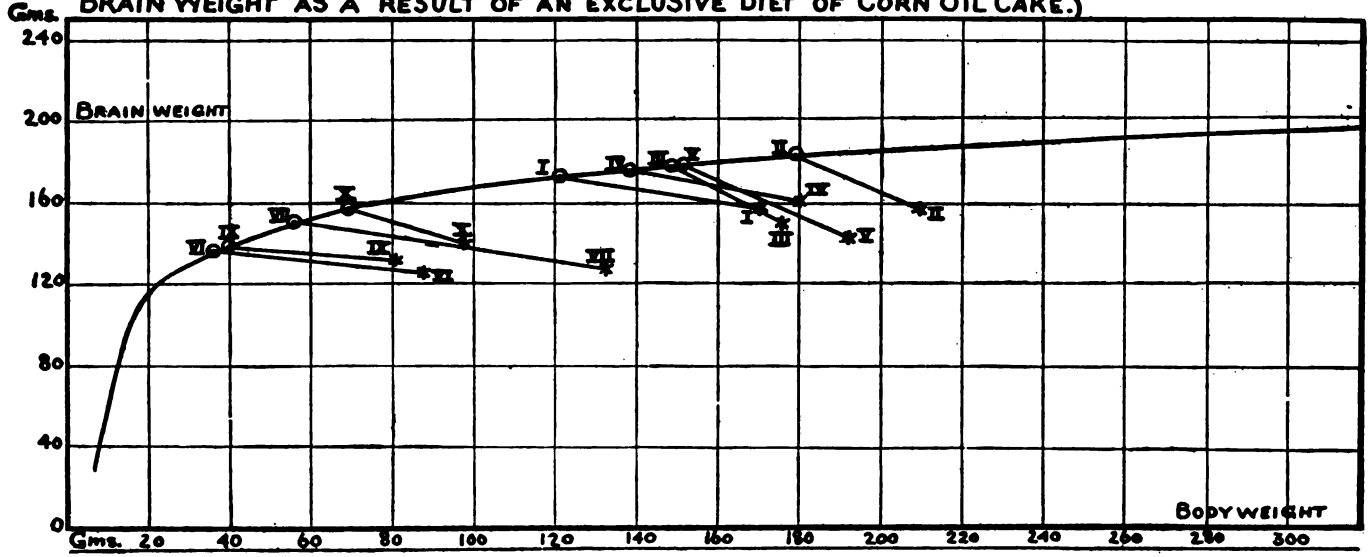
CHART 11. RELATION OF BRAIN WEIGHT TO BODY WEIGHT OF ALBINO RAT. (SHOWS LOSS OF BRAIN WEIGHT AS A RESULT OF AN EXCLUSIVE DIET OF CORN OIL CAKE.)



Explanation: The Roman figures represent litters of rats.
* represents brain weight for an animal of the corresponding body weight as calculated by Donaldson's formula: Brain weight $= 0.569 \log.$ (body weight $- 8.7$) $+ 0.554$.
* represents loss of brain weight as compared with the corresponding body weight.
The curve represents the normal relation between brain weight and body weight (Donaldson).

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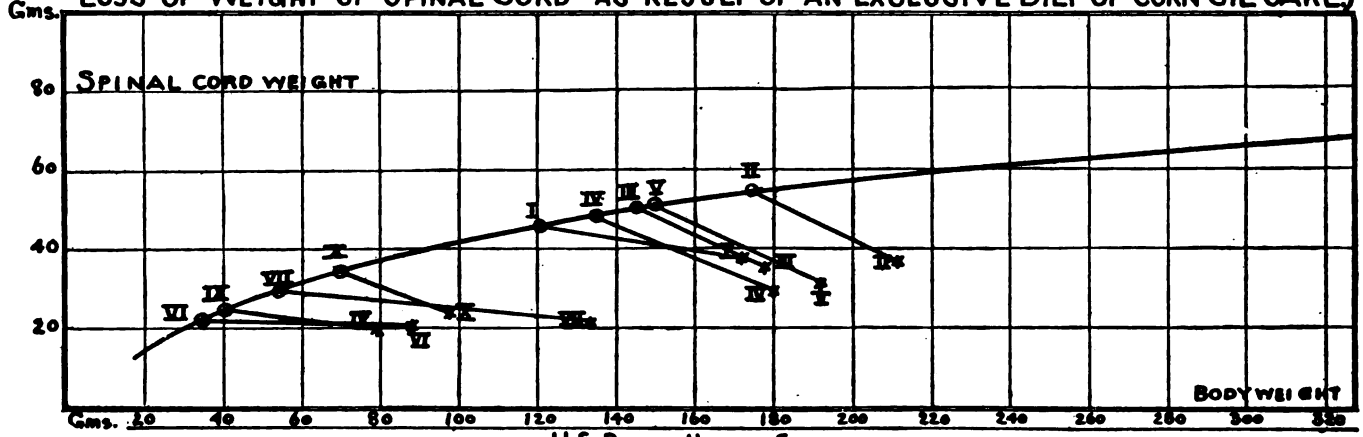
CHART 12. RELATION OF WEIGHT OF SPINAL CORD TO BODY WEIGHT OF ALBINO RAT. (SHOWS LOSS OF WEIGHT OF SPINAL CORD AS RESULT OF AN EXCLUSIVE DIET OF CORN OIL CAKE.)



The Roman figures represent litters of rats.
The curve represents the normal relation between the weight of the spinal cord and body weight and was obtained by Donaldson's formula: Weight of spinal cord =0.585 log. (body weight +21) —0.795.

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that a number of pathological conditions observed in nervous diseases may ultimately be explained by some as yet unknown abnormality in diet.

CONCLUSIONS.

Chemical changes in the brain and cord are observed in animals (monkeys and rats) as the result of an exclusive vegetable diet of various composition.

Histological examination of the central nervous system of these animals reveals extensive degeneration of many nerve tracts in the spinal cord, very similar to those found in pellagra.

In some of the animals the chemical changes are practically identical with the changes observed in pellagra. These findings therefore yield additional evidence for the theory that pellagra is a dietary disease.

ACKNOWLEDGMENTS.

The authors are indebted to Dr. M. G. Greenman, director of the Wistar Institute, for his kindness in providing the Albino rats used in this investigation, and to Dr. Sundwall for the notes on the histological examination of the tissues.

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II. CHEMICAL CHANGES IN THE CENTRAL NERVOUS SYSTEMS IN PELLAGRA.[1]

By MATHILDE L. KOCH, Special Expert, and CARL VOEGTLIN, Professor of Pharmacology, United States Public Health Service.

Pellagra is a chronic disease, characterized by pathological changes in the skin, the gastrointestinal canal, and the nervous system. The changes of the nervous system are probably the most important in regard to prognosis and etiology. It is still a question under discussion whether or not the skin and gastrointestinal symptoms will be explained, on final analysis, as being primarily due to some extent to disturbances in the nervous system. It is therefore obvious that the study of the nervous system in pellagra from all points of view is of great importance.

The clinical study of the nervous system in pellagra brings out the fact that almost all patients suffering from this disease exhibit a variety of symptoms referring to an abnormal condition of the nervous system. Increased or abolished reflex excitability is a common occurrence in pellagra. Sensory disturbances occur in a large majority of cases. A mild degree of psychic disorder, such as sleeplessness, depression, irritability, etc., forms part of the clinical picture. In severe cases various types of psychosis develop in the later stages of the disease. The statement of the older writers on pellagra that this disease leads to insanity is true in a certain percentage of cases. The causal relations of pellagra to insanity have been the subject of much discussion. While the older students of the disease speak of a true pellagrous insanity, the modern investigations on this subject (Gregor, Green, Babcock, Rossi,[2] Singer et al.) rather point to pellagra as being merely the exciting cause of a preexisting disposition of the patient for a certain type of insanity.

Singer[3] believes that "the mental symptoms bear exactly the same relation to pellagra that the similar disturbances occurring in connection with other infective or intoxicative diseases, such as typhoid and tuberculosis, do to these diseases. About 95 per cent of the mental disorders are the direct result of the pellagrous intoxication,

[1] Manuscript submitted for publication July 27, 1915.
[2] Rossi, Am. Jour. Insanity, 1913, LXIX, 989.
[3] Arch. Int. Med. 1915, XV, p. 163.

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and though the mortality in such cases is much higher than in cases without such disorders, yet the mental disturbances will fully recover if the patient survives." A few exceedingly interesting cases in the Pellagra Hospital, at Spartanburg, S. C., which developed mental disorders during their stay in the hospital, cleared up when a change in diet from one mainly vegetable in character to a mixed diet (rich in animal protein) was made. It was noticed in these cases that a mere change in diet was sufficient to restore the mental disorder, an observation which is of great importance from the etiological point of view. These cases will be reported in the near future in detail.

Pellagra, on the other hand, is especially prevalent in individuals of faulty nervous organization, a fact which has been well demonstrated in the great prevalence of pellagra in the institutions for the insane in the southern United States, Egypt, and other countries.

The histological examination of the nervous system in pellagra was taken up by Tuczek,[1] who, in 1893, in a classical monograph, describes the changes, as follows:

Changes in the nervous system; these are by far the most important and constant post-mortem signs. The hyperæmic and anæmic conditions, or the edema of the central nervous system, though frequently present, are by no means the characteristic changes, neither are those inflammatory conditions, such as pachymeningitis and cerebral and spinal leptomeningitis, or the obliteration of the spinal canal by granulations, or ossific arachnitis, at all peculiar to this malady, they being common to many chronic nervous affections; the most noteworthy and constant lesion, and one that may be taken as peculiar to this disorder, is an affection of the spinal cord, and especially of its lateral columns. The brain, when examined, furnishes generally negative results, apart from the occasionally found pigmentary deposits in the cortical cells and in the adventitia of the smaller vessels, with fatty degeneration or calcification of the intima; atrophy of the cerebrum and its cortex has been found in cases of long-standing mental derangement. The cord lesion, though mainly one of the lateral columns, frequently implicates also the posterior columns; in the former the pyramidal tracts are generally affected with partial involvements of the anterior columns; in the latter the postero-lateral columns are generally left free. The lesion of the lateral columns is shown most prominently in the dorsal regions of the cord, while that of the posterior columns is limited to, or, rather, most distinctly marked in, the cervical and dorsal regions.

Microscopically the affection seems to be a primary degeneration of the nerve fibers, with secondary proliferation of the neuroglia, the walls of the vessels not being necessarily implicated; sometimes granular cells, and more frequently amylaceous corpuscles, are met with in the degenerated areas. Degeneration of the anterior root fibers along the anterior cornua has also been demonstrated, while there is to be found in addition a more or less considerable degree of pigment atrophy of the ganglion cells in the anterior cornua, with sclerosis of the matrix and atrophy of the nerve roots. Besides the excessive pigmentary deposit found in the peripheral ganglia, both spinal and sympathetic, there are no characteristic microscopical evidences in other parts of the nervous system.

[1] Tuczek, F., Klin. u. Anat. Studien über Pellagra, 1893.

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Prior to Tuczek, Tonnini,[1] in 1883–84, described the degenerative changes in the lateral columns of the cord.

Belmondo,[2] in 1890, noted the frequent occurrences of corpora amylacæ in the gray and white substance and the presence of changes in the cord leading to obliteration of the central canal. Increase in neuroglia and atrophy of many nerve fibers was also observed.

Babes and Sion,[3] in 1899, discovered degenerative changes in the brain, particularly in the chromophilic cells of the cortex. The tigroid bodies lose their power of staining with basic dyes and the cells become swollen and vacuolated. The nucleoli are swollen, frequently pushed to one side, and stain poorly. The pigment is scattered throughout the cell body. The pericellular lymph spaces are dilated, and the cell processes appear to be broken off and swollen. Small collections of lymphoid cells are often found. The neuroglia cells surrounding the blood vessels are swollen. These authors also confirmed the findings of Tuczek in the cord.

Parhon and Papinian, in 1905, observed that the neuro-fibrils of the cells also show degenerative changes.

F. H. Harris[4] reported changes in the Purkinji cells:

> The cell protoplasm loses its affinity for basic stains and the nucleus undergoes similar changes. The cells contain a finely granular protoplasm that takes acid stains and in many of the cells only the nucleus retains its power of absorbing basic dyes. The nucleus does not seem to be dislocated in these cells so often as in the pyramidal cells . . . these cerebellar alterations probably explain the ataxic forms of the malady.

Harris was unable to confirm the presence of lymphoid cells, observed by Babes and Sion, anywhere in the tissue.

Brugia and Antonnini described constant degenerative changes in the sympathetic system in pellagra. The cervical and abdominal ganglia show equally marked degenerative changes, with hyperplasia of the connective tissue, sclerosis and constriction of the vessels, reduction of the nerve cells with atrophy and pigmentation. In a mild case atrophy is rarely seen, except there occurs turbid swelling of the cytoplasm, chromatolysis, and various nuclear changes. It is interesting to note that Antonnini brings the degeneration of the abdominal sympathetic into relation with the paretic diarrhea, the lesions of the cervical sympathetic with the erythema.

Lombroso, Harris, and others also noted changes in the sympathetic system.

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[1] Tonnini, Riv. Sperim. di Reggio, 1883, IX, 118; ibid., 1884, X, 63.

[2] Belmondo, F., Riv. Sperim, di freniat., Reggio-Emilia, 1889, XV, 266; ibid., 1890, XVI, 107.

[3] Babes & Sion, in Nothnagel's Spec. Path. u. Ther., 1901.

[4] Transactions National Conference of Pellagra, 1909. See also Rossi, Jour. f. Psychol. u. Neur., 1913, XX, 1.

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The peripheral nerves are as a rule normal. Mott[1] found in one case diffuse degeneration of some fibers. In rare instances pellagra is complicated by beriberi. In such cases one would naturally find extensive peripheral degeneration of nerve fibers. As a rule, however, such changes must not be regarded as typical of pellagra, but must be attributed to either chronic alcoholism, beriberi, or other complications affecting the peripheral nervous system.

To sum up our knowledge of the histological changes in the nervous system in pellagra, it may be said that the brain, cord, and the sympathetic system seem to be affected most, whereas the peripheral nerves appear to be normal, with few exceptions.

The work reported in this paper may be regarded as the first attempt to define the structural changes found in the central nervous system in chemical terms. The value of such an investigation lies in the fact that, if any characteristic changes are found, these might be of some value for explaining to some extent the pathological nature of the disease, besides adding new characteristics to the facts already known concerning the etiology of this disease.

Histological and microchemical analysis of nervous tissue may yield valuable information in regard to the structural and, to a lesser extent, the qualitative changes occurring in the central nervous system under pathological conditions. The qualitative changes revealed by these methods are based on some staining reactions, the true nature of which can not always be ascertained. Quantitative chemical methods, on the other hand, yield important additional information.

All the vital processes of cells have a chemical basis and the process of neural action is chemical, although we know relatively little of its nature.

The authors, in attempting such an investigation, are fully aware of the great difficulties to be encountered in such an undertaking. It may suffice here to mention only that our knowledge of the biochemistry of the nervous system is far behind that of our knowledge of the other organs. The chemical composition of the lipoids especially is still in an unsatisfactory state of development.

It was our aim to determine, by known methods of chemical analysis, any qualitative and quantitative chemical differences which might exist in the nervous system of pellagrins, as compared with that of normal controls. As normal controls of value we considered tissues obtained from patients dead from hemorrhage or acute infections, not involving, as far as could be ascertained clinically, the function of the central nervous system.

[1] Trans. of Soc. Top. Med. & Hyg., 1913, vol. VI, 156.

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Attempts in this direction have already been made, especially by Waldemar Koch, Fraenkel, and his pupils, Mott, Smith, and Pighini. Thus Mott[1] was able to associate the disappearance of the Nissl substance in the neurones in two cases of amaurotic dementia with the decrease of neucleoprotein, and the increase in the glia fibrils with the increase of simple protein.

Waldemar Koch and S. A. Mann[2] examined the brain of nine cases of dementia precox and five brains from cases of general paralysis. They found a diminution of the neutral sulphur in dementia precox, which they explained as being due to the reduction of the oxidative power of the brain. Pighini was able to demonstrate an increased excretion of neutral sulphur in the urine of patients suffering from this disease. The researches of Bornstein[3] seem to confirm this explanation, as he found in the large majority of cases with dementia precox that the respiratory metabolism was decidedly depressed.

In general paralysis Koch, W., and Mann noticed a tendency for the destruction of phosphatides of the brain; the neutral sulphur, however, was not changed. Two cases of melancholia revealed no chemical abnormality.

Pighini and his collaborators[4] observed by means of Fraenkel's method,[5] the following changes in the brain in general paralysis:

1. In the fresh tissue an increase in the water content.

2. Dry substance: An increase in the proteins, which are now present in the same amount as the lipoids.

3. In the lipoid fraction the percentage of cholesterol is increased, and the unsaturated phosphatides (Kephalin, Leucopolein) are considerably decreased; the saturated phosphatides are also decreased.

Pighini believes that the brain in general paralysis is subjected to an excessive lipolytic process (lipoid degeneration), which results in a loss of the brain (especially the cortex) in unsaturated phosphatides. The cholesterol is relatively increased, which is explained on the hypothesis that, while the other lipoids are removed from the pathological cells, the cholesterol for some unknown reason remains in situ.

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[1] Mott, F. W., Arch. of Neurol., 1907, 111, 218.

[2] W. Koch and S. A. Mann, Arch. Neurol. and Psych., 1909, IV.

[3] Bornstein, A., Münch. Med. Woch., 1913, p. 1994.

[4] Carbone and G. Pighini, Biochem. Zeitsch., 1912, vol. 46, p. 450; ibid., 1914, vol. 63, p. 304.

[5] Fraenkel's method is based on the separation of the various lipoids by means of organic solvents, such as aceton, petrolether, benzol, alcohol, and ether.

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CHEMICAL CONSTITUENTS OF NERVOUS SYSTEM.

For a better understanding of the methods used in this investigation and for the sake of a correct interpretation of the results obtained it may not be out of place to give a short summary of our present-day knowledge of the chemistry of the nervous system, including the anatomical distribution of the various chemical constituents.

Like other organs the nervous system is composed of three larger groups of substance:

I. Water.
II. Proteins.
III. Lipoids.
IV. Extractives (organic water-soluble compounds, not colloidal in nature, and inorganic salts).

I. WATER.

Water is present in largest amount:

Brain, 75–80 per cent.
Cord, 68 per cent.

According to Donaldson [1] the percentage of water in the brain decreases with growth, and if found increased above the normal in the adult brain indicates a pathological change.

II. PROTEINS.

(*a*) Globulin α coagulating at 47–50° C.
(*b*) Globulin β coagulating at 70–75° C.[2]

These two substances do not contain phosphorus. They were not tested for sulphur.

(*c*) Neurostromin [3] extracted from cerebral cortex by means of NaOH.
(*d*) Nucleoprotein [4] contains 0.75 per cent phosphorus; coagulates at 56 to 60° C.
(*e*) Neurokeratin [5] contains 1.63 to 2.2 per cent sulphur in the form of cystin.[6]

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[1] Donaldson, Jour. of Neurol. and Psych., 1910, XX, 119.
[2] Halliburton, collected papers from the Physiol. Lab., Kings College, London, 1893, and Ergeb. Physiol., VI.
[3] Schkarin, Diss. Petersburg, 1902, 1, 453.
[4] Levene, Arch. of Neurol. and Psychophat., 1899, vi. 1, 2, Halliburton.
[5] Kühne and Chittenden, Zeitsch. f. Biol., 1890, XXVI, 291.
[6] Argiris, Zeitsch. Physiol. Chem., vol. 54, p. 86.

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Abderhalden and Weil[1] found the following amino acids (ester method) in the nervous system:

Amino acids.	Gray substance.	White substance.	Cord.	Peripheral nerve.
Glycocoll	0	0	0	0
Alanin	.14	.13	.18	.24
Valin	.26	.29	.15	.20
Leucin and isomers	.66	.63	.39	.38
Serin	.....	.02	.006	.01
Aspartic acid	.07	.02	.02	.....
Glutaminic acid	.50	.34	.36	.59
Lysin	.39	.39	.18	.28
Arginin	.13	.38	.21	.26
Phenylalanin	.....	.03	.....	.....
Tyrosin	.26	.18	.14	.17
Prolin	.04	.04	.02	.04
Trytophan	+	+	+	+
Histidin	.03	.06	.02	.04
	2.48	2.53	1.68	2.21

Anatomical distribution.—In the part of the nervous system rich in cells (cortex) the proportion of the protein is larger than in the white matter. Some of the nucleoproteins are supposed to be associated with the chromatin and Nissl substance of the nerve cell. The remainder of the nucleoproteins are represented by the nuclei of the glia cells scattered throughout the nervous system. Neurokeratin occurs in the medullated sheath of the nerve fiber (25–29 p. m. in corpus callosum). The other proteins occur in the axon of the nerve fiber as well as in the cell body and its dendrites.

Physiological significance.—The proteins have usually been considered as the essentially living part of the protoplasm, but some of them, like neurokeratin, are undoubtedly inactive and represent supporting structures. The same may be said of the proteins which make up the fibers of the glia cells. It is therefore impossible to tell at the present time to just what extent and in what proportion the proteins are involved in the chemical activities of the nervous system. The significance of the neutral sulphur compounds, which represent simpler cleavage products of the larger protein aggregates, will be discussed later as having an important bearing on this point.

[1] Zeitsch. Physiol. Chem., 1913, vol. 83, p. 426.

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III. LIPOIDS.

(A) PHOSPHATIDES CONTAINING N. AND P.

(1) Unsaturated phosphatides.

Kephalin $C_{42}H_{80}NPO_9$[1] contains an unsaturated fatty acid and stearic acid,[2] an organic base,[3] glycerin, and phosphoric acid.[4] Kephalin can undergo autoxidation and is a hydrophylic colloid.

Myelin $C_{40}H_{75}NPO_{10}$ (Thudichum) contains unsaturated fatty acids.

(2) Saturated phosphatides:

Sphingomyelin (Thudichum) recently studied by Levene,[5] who gives it the composition $C_{64}H_{11}N_2$.

N : P=2 : 1 (approximately).

It contains no free amino-nitrogen, but contains three methyl groups to two atoms of N, hence one N atom in the form of cholin. On hydrolysis the following substances are obtained: H_3PO_4, cerebronic and lignoceric acid, cholin, and two unidentified bases.

Besides these phosphatides Thudichum isolated from brain other phosphatides, which were not studied extensively and may possibly be considered as derivatives of the above compounds.

Amidokephalin, $C_{42}H_{82}N_2PO_{12}$.
P : N=1 : 2.
Paramyelin, $C_{32}H_{72}NPO_9$.
Assurin, $C_{46}H_{94}P_2O_9$.
Amidomyelin, $C_{44}H_{88}N_2PO_8$ (present only in very small amounts).
Oxykephalin, $C_{42}H_{78}NO_{14}$.
Peroxykephalin, $C_{42}H_{78}NOP_{12}$.

Anatomical distribution.—Comparison of cortex and corpus callosum indicates that the phosphatides are not very differently distributed between cell body and nerve fiber. Analyses of the brain at a period when medullation has not begun, but when the cell processes are growing freely, indicate that the phosphatides are largely associated with the axon. If mitochondria consist largely of phosphatides, as has been suggested, the observations of Cowdry would give us a picture of their distribution in the cell body. The absence of mitochondria in the axon, which is known to contain phosphatides, would not argue against this, as there is some evidence that the phosphatides of the processes and the cell body are different in their

[1] Thudichum, Chemische Konstitution des Gehirns. 1901.
P : N : CH_2=1 : 1 . 1.
Also Neubauer, Biochem. Zeitsch., 1909, XXI, 321.
[2] Levene, Jour. Biol. Chem., 1913, XVI, 419.
[3] $NH_2CH_2CH_2OH$. Renall, Biochem. Zeitsch., vol. 55, p. 296.
[4] MacArthur, Jour. Am. Chem. Soc., 1913, XXXVI, 2397, was unable to isolate cholin and neurin from kephalin.
[5] Levene, Jour. Biol. Chem., 1914, xviii, 454.

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behavior. According to Halliburton [1] the Marchi reaction indicates the liberation from lipoids of unsaturated fatty acids, which reduce osmic acid to a lower oxid with a black appearance.

Physiological significance.—The phosphatides, like the proteins, may be considered to be intimately associated with the vital processes of the living protoplasm. Their colloidal nature and relation to inorganic ions, as well as their instability toward heat, lend support to this idea. They occur largely in the cytoplasm, cell body, and its branches, where they may act as oxygen carriers, as has been suggested by the work of Koch and Mostrom,[2] Fraenkel and Dimitz,[3] as well as Signorelli.[4]

(B) CEREBROSIDES.

Complex combination of fatty acids, galactose, and a basic substance, sphingosine.

According to Levene [5] the cerebrosides differ among themselves, not only in their behavior toward solvents, but also in their optical activity. The fatty acids (cerebronic acid and an acid $C_{24}H_{48}O_2$) entering the molecule of different cerebrosides are not identical. One of these, cerebronic acid $C_{25}H_{50}O_3$ contains a (OH) group, is dextrorotatory, and yields on oxidation an acid of the same formula as lignoceric acid, which is isomeric with normal tetracosanic acid.[6]

(1) Phrenosin $C_{41}H_{79}NO_8$ Thudichum.

Splits off galactose, a base, sphingosin, and an acid on acid hydrolysis. Sphingosine $C_{17}H_{35}NO_2$ is, according to Levene and Jacobs,[7] an unsaturated Monoaminodihydroxyalcohol $C_{21}H_{25}CH=CH.CHOH.CHOH.CH_2NH_2$.

(2) Kerasin [8] $C_{44}H_{88}NO_8$ (Thudichum) yields on acid hydrolysis galactose, a base (probably sphingosine) and an acid (cerebronic acid).

(3) Cerebron $C_{46}H_{90}NO_9$ (Thierfelder and Wörner [9]) yields on hydrolysis galactose, sphingosine and cerebronic acid.

Anatomical distribution.—Although the cerebrosides are occasionally met with in other tissues, they occur in largest amounts in the medullated nerve fiber, and their quantity increases as medullation proceeds.[10] The rather large amount found in the cortex on chemical

[1] Halliburton, Biochemie der Perripheren Nerven. Erg. Physiol., VI.
[2] Koch, Waldemar, and Mostrom, Jour. Pharmacol. and Exp. Therap., 1910, II, 265.
[3] Fraenkel and Dimitz, Wein, Klin. Woch., 1909, No. 51.
[4] Signorelli, Biochem. Zeitsch., 1910, XXIX, 25.
[5] Levene, Jour. Biol. Chem., 1913, XV, 350.
[6] Levene, Jour. Biol. Chem., 1912, XII, 381; ibid., 1913, XV, 193; ibid., 1914, XVIII, 478.
[7] Levene and Jacobs, Jour. Biol. Chem., 1912, XI, 548.
[8] Rosenheim, Biochem. Jour., Vol. XII, p. 604.
[9] Thierfelder and Wörner, Zeitsch. Physiol. Chem., 1904–5, XXXXIII, 21; ibid., 1905, XXXXIV, 366; ibid., 1906, vol. 49, 286.
[10] Smith and Mair, Jour. Path. and Bact., 1912–13, XVII, 123; ibid., XVII, 418; ibid., XV, 179.

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analysis indicates that they may predominate in the fibers of that region.

Physiological significance.—As laid down in the medullated nerve fiber, the cerebrosides most probably serve only a mechanical function and are not available as sources of energy, in spite of their carbohydrate and fatty acid content.

(c) SULPHATIDES.

Thudichum described a sulphur and phosphorus containing lipoid, which he was unable to obtain in a pure form. Waldemar Koch[1] isolated from human brain, by means of successive extractions with various organic solvents (ether, alcohol, pyridin), a yellowish white powder, insoluble in cold alcohol and ether, crystallized from hot pyridin; contains a reducing sugar, phosphorus, and sulphur in its molecule. Koch considered this substance to contain an equimolecular proportion of H_3PO_4 and H_2SO_4. The substance analyzed as follows:

S	1.96	Sugar	12.3
P	1.77	N	2.3

The analytical data led him to assume the following constitution for the sulphatide:

$(C_{41}H_{79}NO_8)—O—SO_2—O—(C_{82}H_{164}N_2PO_4)$.
(Cerebroside)—O—SO_2—O—(phosphatide).

Recently Levene[2] isolated from beef brain a sulphatide free from phosphatide. The substance is dextro-rotatory and melts at 210° C. "By the method employed for the preparation and purification * * * it was not possible to further purify the substance." The method of isolation is not mentioned.

Under these conditions the chemistry of the sulphur containing lipoid of the nervous system must be considered as unsatisfactory. It may be stated, however, that the discrepancy in the findings of Koch and Levene may possibly be due to a difference in the method employed for the isolation of the sulphatide. As will be noticed, Koch used more or less indifferent solvents in his method. It might be possible that Levene employed a method involving the use of hydrolytic chemicals, which could have lead to a splitting off of the phosphatide group. This is merely a suggestion, as Levene's method was not published up to the present. We have adopted in our work provisionally the formula proposed by Waldemar Koch. At the same time we fully realize the unsatisfactory state of our knowledge of the sulphatide. Our investigation deals largely with comparative studies

[1] Waldemar Koch, Zeitsch. Physiol. Chem., 1910, 1, XX, 94; ibid., Jour. Biol. Chem., 1912, XI, Proceedings.

[2] Levene, Jour. Biol. Chem., 1913, XIII, 463.

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of pathological and normal nervous tissue. It is immaterial, therefore, whether or not we express the quantitative changes in the lipoid sulphur in terms of sulphatide (Koch).

Anatomical distribution.—The sulphatides, like cerebrosides, increase parallel with the growth of the medullary sheath and may be considered as essential constituents of that structure. The fact that the sulphatides, as the result of more recent work, have been found to be pretty generally distributed in other tissues indicates that they might occur in the cell body of the neurone, although a comparison of the analysis of cortex and corpus callosum does not make this very probable. The sulphatides have an important function in the maturing of the nerve fiber and give the Weigert staining reaction in a very characteristic manner.

Physiological significance.—Their colloidal nature and the peculiar combination into which the sulphatides enter with potassium suggests that they may have an important relation to the nerve impulse and to the phenomena of conductivity in general.

(D) CHOLESTEROL. $C_{27}H_{46}O$.

It is a monovalent, unsaturated, secondary alcohol. Normal nerve tissue contains largely free cholesterol and practically no cholesterol esters are found.[1]

Anatomical distribution.—Cholesterol is of interest as a constituent of the medullary sheath, to which it adds a sort of mechanical stability; but it is present also in the cell bodies, possibly contributing to the cell membranes. According to Lorrain Smith[2] it is one of the substances (also cerebrosides) responsible for the color which the medullary sheath gives with Weigert's stain.

Physiological significance.—Cholesterol is constantly present with other lipoids in the cells of the body. Cholesterol raises the surface tension of H_2O, lowered by fats and soaps. Lecithin lowers surface tension, whereas cholesterol counteracts this tendency.[3] Cholesterol may therefore play an important rôle in inhibiting cytolysis.

IV. EXTRACTIVES.

Organic water soluble compounds, not colloidal in nature, and inorganic salts:

Hypoxanthin.
Tyrosin.
Leucin.
Urea.

[1] Tebb, Jour. of Physiol., vol. 34; Lapworth, Jour. Path. and Bact., XV, 254; Rachmanow, Beitr. path. Anat., vol. 53, 353.
[2] L. Smith, Journ. Path. and Bact., 1911, XV, 179.
[3] Icovesco, Compt. rend. Soc. Biol., vol. 69, 566.

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Inosit, Müller.
Taurin, or some immediate antecedent, Koch, Waldemar.[1]
Peptones, Thudichum.
Sarcolactic acid, Thudichum.
Under pathological conditions.
Cholin, Mott and Halliburton.
Neuridin, Brieger.
Trimethylamine, Thudichum.

Inorganic constituents.—Na, K, NH_4, Ca, Mg, Fe, present partly as dissociated ions and partly in organic combination.

Anatomical distribution.—This group occurs in large quantity in the cell body, although some is also present in the axon of the nerve fiber.[2]

Physiological significance.—This group is a rough index of the amount of metabolic activity going on in the tissue, as it represents at the same time the intermediary and end-products of metabolism as well as the substratum from which the more complex cell constituents are built up. The K, Na, NH_4, Ca, and Mg ion have a marked influence on nervous function. According to Alcock,[3] K is supposed to play an important rôle in the propagation of the nerve impulse. A. B. Macallum had previously demonstrated that chlorine and potassium are present in the nerve fiber. Mg has a marked depressing effect on the central nervous system (Meltzer and Auer). Ca under certain conditions seems also to inhibit certain nervous functions.

The method used in this investigation permits the quantitative estimation of changes in the water (or solids), protein, total lipoid, and extractives content of the tissue. Besides this cholesterol is determined. The cerebrosides are estimated indirectly by the determination of the sugar content of the total lipoids; the sulphatides and phosphatides by the determination of sulphur and phosphorous is the lipoid fraction.

DISTRIBUTION OF NITROGEN, PHOSPHORUS, AND SULPHUR.

It may not be out of place for a better understanding of the method to state briefly the reasons for selecting nitrogen, phosphorus, and sulphur for special determinations in preference to other elements.

Nitrogen.—This element is an important constituent of proteins. It enters the body with the food largely in the form of protein. Nitrogen is a constituent of the proteins and of some lipoids in the nervous system. An increase in extractive nitrogen may indicate an increase either of proteolytic or lipolytic processes. If the protein

[1] Koch, Zeitsch. f. Physiol. Chem., 1907, liii, 496.
[2] For a summary see G. Perits; Handbuch der Biochemie, Oppenheimer, vol. 11, p. 299.
[3] Alcock, Jour. Physiol., 1911, XXXIX, 402.

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content is found to be normal, an increase in extractive nitrogen might indicate an abnormal destruction of some lipoids.

Sulphur.—This element enters the body mainly as cystin (reduced S.) and leaves it mainly in an oxidized form as sulphate. Sulphur enters into the composition of certain proteins (neurokeratin) as cystin sulphur. Sulphur also is found in the extractives as inorganic sulphate and as neutral sulphur. The latter is considered by Waldemar Koch as sulphur in an oxidized form like taurin. This group of compounds represents the total noncolloidal, water-soluble combinations of sulphur minus the inorganic sulphates. They resemble in all their reactions the proteinic acids of the urine. It is interesting in this connection to call attention to the increased excretion of urinary neutral sulphur in poisoning by potassium cyanide[1] and carbon monoxide.[2] These substances are known to reduce the oxidative capacity of the organism. Part of the sulphur, which normally is excreted as inorganic sulphate, leaves the body under these conditions only partially oxidized. The study of the protein and neutral sulphur gives us a means to study the protein metabolism of the nervous tissue. Its distribution between protein and extractives permit conclusions with regard to the metabolism of protein. An increase in extractive sulphur, with a corresponding decrease in protein sulphur, may be interpreted as the result of proteolytic processes in the pathological tissue. During growth this relation between protein sulphur and neutral sulphur is changed to a striking degree, as shown by the following table:

Comparison of neutral sulphur with protein sulphur in the brain of the albino rat at different ages (figures in per cent of total sulphur).

	Protein sulphur.	Neutral sulphur.
1 day	30.5	48.2
10 days	44.5	45.4
20 days	56.4	28.6
40 days	63.7	18.2
120 days	61.8	18.7
210 days	63.8	14.5

During the early stages when growth is proceeding rapidly and chemical activities may be considered to be at their height the proportion of noncolloidal, relatively smaller, neutral sulphur molecules is at a maximum. This is what we should expect when we consider living matter not as a collection of highly organized molecules but rather as a heterogeneous substratum in which relatively smaller molecules or their dissociated products are engaged in chemical transformations. As the tissues grow and become more highly

[1] Richards and Wallace, Jour. Biol. Chem., 1908, IV, 179.
[2] Benedikt, Zeitsch. Klin. Med., 1898, XXXVI.

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differentiated and mature, more and more protein is laid down as structural material, and the proportion is shifted in the direction of the protein sulphur. A comparison of the cortex of the human at two years and at maturity illustrates this point:[1]

2 years' cortex.....Protein sulphur, 63; neutral sulphur, 22
19 years' cortex.....Protein sulphur, 73; neutral sulphur, 12

The change suggests, therefore, a decrease in chemically active material associated with the increasing complexity of the tissue. Such data as we have at hand indicate that we have in the protein sulphur and neutral sulphur ratio a valuable means of measuring the relative growth intensity of the nervous system at different periods during its development after the state of cell division has practically ceased.

There might be another way of measuring this intensity of chemical activity, namely, by means of the inorganic sulphates, which represent the end products and the final state of oxidation of the compounds involved in these reactions, but they are eliminated rather easily from the cell, and it is therefore difficult to attach any significance to their variations.

The lipoid sulphur is probably present in some esterlike combination of sulphuric acid with lipoids. It forms an essential constituent of the medullary sheath. The proportion in which it occurs in nerve fiber can be considered as a measure of the maturity of the sheath.

Phosphorus.—This element enters and leaves the body in the same state of oxidation. It is always present as phosphoric acid or its derivatives. The study of its distribution gives us some information as to the content of the various fractions in nucleins (protein fraction) and phosphatides (lipoid fraction). The nucleins are important constituents of the nucleus of every cell. The phosphatides, in particular the unsaturated which form the larger part, are important in their relation to oxidative processes. On account of their chemical composition, being compounds of unsaturated fatty acids, they are supposed to act as oxygen carriers. The extractive phosphorus is largely composed of inorganic phosphates, but may also be present in some organic combination which it is difficult to estimate.

Enzymes of nervous tissue.—The enzymes of the nervous system are not very active or they may be present only in small amounts.

Levene and Stookey[2] describe a proteolytic enzyme which is more active in 0.2 per cent acetic acid than in a neutral or alkaline solution. These observations were confirmed by Murachi Nagatawa,[3] Traetta-

[1] Koch, W., and Mann, Jour. Physiol., 1907, XXXVI, 2.
[2] Levene and Stookey, Jour. Med. Research, 1903, V. 212.
[3] Murachi Nagataka, Zent. Biochem. Biophysik., XV, 675.

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Mosca,[1] and F. Simon.[2] Worbleski[3] believes to have demonstrated the presence in brain of a catalase, peroxidase, lipase, amylase, and enzymes splitting arbutin and salol. According to Simon an enzyme capable of splitting off phosphoric acid from phosphatides also exists in the brain. Pighini[4] claims to have found a substance in the cortex which acts as a catalyser in the oxidative synthesis of phenylenediamine and naphtol to indophenol. Rosell[5] was unable to obtain an indophenol reaction, but claims to have found an aldehyd oxidation.

PHYSIOLOGICAL AND PATHOLOGICAL SIGNIFICANCE.

Soula[6] determined the catabolism in the brain and medulla of experimental animals after stimulation of the nerve centers by hyperthermia, prolonged asphyxia and convulsant drugs (cocaine), and by depression of the nervous system by hypothermia, morphine, chloroform, and diphtheria toxin. The catabolism was measured by the relative proportions of nitrogen as protein, polypeptide, aminoacid, and ammonia nitrogen after autolysis of the tissue. The results show that increase in nervous activity increases nitrogen catabolism; diminished nervous excitability lowers the intensity of protein disintegration.

The oxygen consumption of the nervous system has been studied by many investigators. Recently Buijtendijke[7] found that isolated pieces of nervous tissue in Ringer's solution consumed relatively much more oxygen than did muscular tissue. Brain irritated by means of an induction current showed an increased oxygen consumption.

Winterstein,[8] working with Thumberg's respirometer, came to the conclusion that the isolated cord of the frog consumes large quantities of oxygen. Hill and Nabarro[9] analyzed the blood going to and coming from the brain for oxygen and CO_2. Clonic and tonic convulsions did not seem to influence the content of O and CO_2 of the blood, which they interpret as evidence of a low degree of oxidation of the brain. This interpretation is undoubtedly open to grave criticism and does not in any way contradict the findings of Winterstein and others. The large amount of unsaturated substances with autoxidative properties in nervous tissue would speak more in favor of the

[1] Traetta-Mosca, Gass. Chem. ital., vol. 43, 11, p. 88.
[2] F. Simon, Physiol. Chem., vol. 72.
[3] Worbleski, Farm. Polsk. Zesz., 1913, vol. 65, p. 67.
[4] Pighini, Biochem. Z., vol. 42, p. 124.
[5] Rosell, Diss. Strassburg, 1901.
[6] Soula, Jour. Physiol. et Path. gen., 1913, XV, 267.
[7] Buijtendijke, Proc. Acad. Wetenchappen, 1910, XII, 577.
[8] Winterstein, Zeit. allg. Physiol., 1907, VI, 315.
[9] Hill and Nabarro, Jour. of Physiol., 1895, XVIII.

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view that this tissue possesses a considerable capacity for oxidation. This is brought out by experiments previously described, demonstrating the consumption of large amounts of oxygen by Kephalin. On the whole, it may be said that the oxidative properties of nervous tissue may very well be due to such compounds as Kephalin, which would make the assumption of specific oxidative enzymes unnecessary.

The fact that Simon demonstrated the presence of an enzyme capable of splitting off phosphoric acid from phosphatides is of particular pathological interest. This enzyme may explain the destruction of phosphatides which was observed in certain diseases of the nervous system (general paralysis). The ultimate primary cause for the stimulation of this enzymatic process, however, is still obscure.

ANALYTICAL METHODS.

The method used in this investigation is based in the main on the method elaborated by Waldemar Koch for the analysis of brain tissue.[1]

Slight modifications have been introduced from time to time in the course of investigations by one of us (M. K.) and by F. C. Koch. At the suggestion of Koch the modification of the sulphur method was adopted. This modification consists, as will be explained later, in the removal of nitrates and nitrous acid from the oxidized material by evaporation to dryness on the steam bath with an excess of HCl.[2]

[1] Archives of Neurology and Psychiatry, 1909, IV, 11; Journ. Am. Chem. Soc. (1909), Vol. XXXI, p. 1340.

[2] This modification has proved of great value in obtaining accurate results in our sulphur fractions.

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OUTLINE OF ANALYTICAL PROCEDURE FOR THE CHEMICAL ANALYSIS OF NERVE TISSUE.

The principle involved consists essentially in separating the material preserved in alcohol into three larger groups, viz: Fraction 1 (F_1) or lipoids, fraction 2 (F_2) or extractives, and fraction 3 (F_3) or protein residue.

<table>
<tr><td colspan="3">FRESH NERVOUS TISSUE.
(Preserved in alcohol at time of collection, then extracted alternately with 95 per cent alcohol, ether, water, and again with alcohol.)</td></tr>
<tr><td colspan="2">Extract (F_{1+2})
(soluble in alcohol, ether, and water).
Evaporate to dryness; emulsify with water; precipitate with $CHCl_3$ in 0.5 per cent HCl solution.</td><td>Residue (F_3)
(insoluble in alcohol, ether, and water).
Dry and weigh to constant weight.</td></tr>
<tr><td>Precipitate Lipoids (F_1).
Phosphatides.
Cerebrosides.
Sulphatides.
Cholesterol.
In this fraction are determined—
Lipoid sulphur.
Lipoid phosphorus.
Lipoid nitrogen.
Lipoid sugar.
Cholesterol.</td><td>Filtrate Extractives (F_2).
Organic extractives and inorganic constituents.
In this fraction are determined—
Neutral sulphur.
Inorganic sulphate.
Org. ext. phosphorus.
Org. ext. nitrogen.</td><td>Protein residue (F_3).
Proteins (including supporting structures).
In this fraction are determined—
Protein sulphur.
Protein phosphorus.
Protein nitrogen.</td></tr>
</table>

COLLECTION AND PRESERVATION OF NERVOUS TISSUE FOR CHEMICAL ANALYSIS.

In collecting nervous tissue for chemical analysis, it is desirable to collect it as soon as possible after death. It should be as free as possible from adhering membranes and blood, which are really foreign to the material proper. If it is not possible to collect the material immediately, it should be kept in a cold place, wrapped in a clean moist towel, leaving the dura intact until the material can be taken in hand.

Division of central nervous system previous to collection of samples.—Cuts should be made between cerebrum, cerebellum, and spinal cord at the following points:

For the division between cerebrum and cerebellum an incision is made through the optic thalamus and corpora quadrigemina, and the pia mater is stripped from both the cerebrum and the cerebellum.

For the division between the cerebrum and spinal cord an incision is made through the first cervical nerve below the fourth ventricle, and the spinal cord is freed by cutting the cervical nerves close to trunk; another incision is made at the tip of the cauda equina. (If portions of these tissues have been removed for other purposes, such as histological examination, it should be noted.)

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The entire tissue—that is, cerebrum, cerebellum, and spinal cord—should be weighed separately, before grinding, and weights recorded on separate sheet under "Weight of entire tissue."

Collection of samples for chemical analysis.—To enable one to obtain representative samples from the cerebrum and cerebellum, it is very important to have the material very finely divided and then very thoroughly mixed before taking any of it for analysis. The method here employed for reducing the fresh material to a fine state of division is to grind same in a clean meat chopper. If, however, the entire tissue is taken for one analysis, as the cord, it should be cut up into small pieces with a clean sharp pair of scissors.

Preservation of samples for chemical analysis.—From the thoroughly mixed sample 50 grams, preferably 75 grams, is transferred to a 250 to 300 c. c. beaker containing a glass rod and weighed to 0.01 gram on a torsion balance. From this the material is transferred to a 750 to 1,000 c. c. wide-mouthed bottle or to a Jena Erlenmeyer flask of equal capacity, containing 100 c. c. of absolute alcohol. The beaker with glass rod is weighed back rapidly and the weight of material is recorded on the bottle. If possible one or more samples of each tissue should be collected in this way, using the same beaker and glass rod. The entire cord should be taken for one sample. It is very important that the manipulation and weighing should be done as rapidly as possible in order to avoid a loss of water. To the material in each bottle is now added an extra amount of redistilled 95 per cent or absolute alcohol so that, after allowing for the water content in the original fresh tissue, the resulting mixture will be equivalent to an 80 to 85 per cent alcoholic solution. The percentage of water of the brain is from 75 to 80 per cent and that of the cord is about 68 per cent. If a given sample weighs less than 30 grams, the sample must be collected from a number of animals, as was done in the rat material.

The following data should be recorded on the label of the bottles: (1) Date of collection, (2) tissue collected, (3) weight of sample taken, and (4) the number of the sample, as 1, 2, 3, according to the number of samples collected from one tissue.

After all the samples have been collected for the day the material is stirred with a clean glass rod or spoon, carefully breaking up the lumps. The bottles are then placed for one hour in a water bath, starting with cold water and bringing it up to 70° C., and keeping it at this temperature for one hour. This is to insure thorough penetration of the alcohol and good preservation of the sample.

In case the sample is to remain in the laboratory a glass-stoppered, wide-mouthed bottle, or a Jena Erlenmeyer flask fitted with a cork stopper covered with tin foil, will answer the purpose; but in case the material is to be shipped it is better to use a wide-mouthed bottle

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of strong glass which is supplied with a well-fitting cork stopper, covered with tin foil.

The material preserved in this way should be kept not less than two weeks and not more than three months before it is taken in hand for chemical analysis.[1]

EXTRACTION OF THE ALCOHOL-PRESERVED MATERIAL.

(Into two preliminary fractions (F_1+_2)=alcohol, ether, and water soluble, and (F_3)=alcohol, ether, and water insoluble.)

Preparation for extraction.—Two to five extraction cups are fitted with ashless filter paper (size 11 cm.) by folding the paper over a block which is the exact size of the inside of the extraction cups. The folded filter paper placed into the cups is washed with redistilled alcohol, and allowed to dry on the steam bath. These paper cups are then transferred to clean, dry, glass-stoppered weighing bottles, properly numbered with a glass marker, and placed, with the stopper of the weighing bottle uncovered, in an electric or water-jacket oven for 24 hours at 105° C.

After weighing each filter paper cup in its respective weighing bottle it is transferred back to the porcelain cup. This is now placed in a 10-cm. funnel and the material transferred quantitatively into it. The last particles adhering to the sides of the collecting bottle are removed by the use of very little distilled water and a proper bent glass rods.[2]

All the vessels used in the transference of the material from bottle to cups are finally washed with a fine jet of hot 95 per cent alcohol and filtered through the cups. A small perforated porcelain plate is placed on the material, and after allowing them to drain well the cups are suspended by means of platinum or nickel wires to the proper condensers. These are fitted with a clean flask containing redistilled 95 per cent alcohol and a hot extraction continued from three to four hours. The alcohol in the flasks should not touch the bottom of the extraction cups. The temperature of the electric plate for alcohol extraction should vary from medium to high, for ether extraction from low to medium. All the filtrates, washings, and extractions from the above procedure are saved. Proceed with this as directed below (p. 71). For extraction apparatus, see Plates I and II, facing page 70.

The above alcohol extraction is immediately followed by a one-hour extraction with redistilled ether. The ether extract (after removing most of the ether on a water bath heated by steam) is added to the above alcohol extracts. If it is difficult to remove the residue

[1] Koch, W., Journ. Amer. Chem. Soc., 1909, XXXI, 1340.

[2] A rubber policeman should never be used in alcohol, ether, acetone, or similar solvents.

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from the ether extract from the flasks, a few drops of chloroform, and finally a small amount of hot water, will usually dissolve any such residue.

The residue left in the extraction cups, after allowing it to become dry, is carefully removed from the cups without disturbing the filter paper cups and is ground carefully in a glass mortar to a fine powder. In case the material is tough or stringy and will not powder, as the spinal cord, it should be cut up as fine as possible with a pair of scissors and then ground under the pestle in the mortar. The powdered dry material is removed to a 250 c. c. beaker and 50 to 200 c. c. warm water added. This is allowed to digest on the steam bath for 15 minutes, when the supernatant liquid is decanted into another beaker. This water treatment is repeated four times. The total decanted solution is concentrated on the water bath to about 25 c. c. This is then added to the wet powdered material, well mixed, and enough 95 per cent redistilled alcohol added to make the concentration about 80 to 85 per cent. This is then heated to boiling or until the alcohol solution has lost its milky appearance, which indicates that the water soluble proteins have been coagulated by the alcohol, and all the material again transferred back to the original extraction cups and again extracted with redistilled 95 per cent alcohol for 12 hours in the extraction apparatus.

During the entire extraction the extracting fluid should boil gently; about every two seconds one drop should fall from the condenser, and thus the material kept thoroughly soaked.

The apparatus used for the extraction is a modification of the old form of Wiley extraction apparatus, and was designed by Waldemar Koch, according to his suggestion, by Gallenkamp & Co., London. The advantage of this form over the Soxhlet, especially for the work with nerve tissues, is that the extraction takes place at the boiling point of the solvent.

The apparatus (Pl. II) consists of a wide-mouthed CO_2 flask of 300 c. c. capacity, into which is fitted, by means of a ground-glass connection, a small double-surface condenser. To the lower end of the condenser are fused two glass hooks, on which the perforated extraction cups are suspended by means of thin platinum or nickel wires. Each condenser is fitted with at least three interchangeable flasks. If dry heat is used for the extraction (electric plate) the above form of condenser answers the purpose, but should a water bath be used the escaping steam will condense on the external surface of the condenser and, creeping into the ground-glass connection, may cause it to stick. With a water bath, a Hopkins condenser, in which the cooling is accomplished from the inside, prevents this source of annoyance. Electric hot plates have the disadvantage that they are heated irregularly, but if used carefully (place

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ELECTRIC HOT PLATE SHOWING A NUMBER OF EXTRACTIONS PROCEEDING AT THE SAME TIME.

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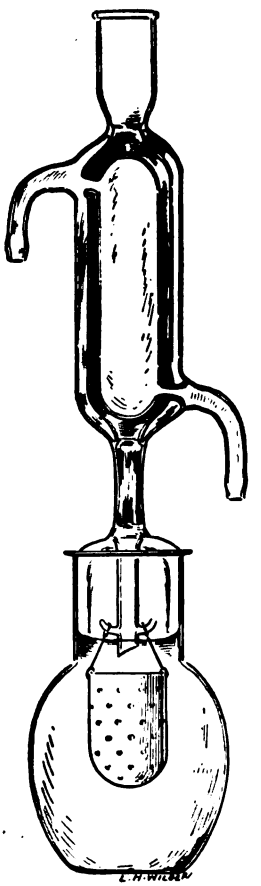

EXTRACTION APPARATUS.

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a thin asbestos sheet under the flask) a great deal of time is saved and the risk of fire is eliminated. Plate I shows a number of extractions proceeding at the same time. These, when once started, require but little supervision, and can be left running during the night for the final extraction.

ESTIMATION OF SOLIDS.

(The solids represent the total dry weight of F_3 and F_{1+2} combined.)

Estimation of solids in fraction 3 (F_3).—The residue in the cups at the end of the 12-hour extraction is now allowed to dry on the steam bath. The paper cups with contents are now removed to the proper weighing bottles and dried in the oven at 105° C. until constant in weight. This weight of protein residue is now referred to as fraction 3 (F_3) and represents the total solids in this fraction. (For further treatment of this material see "Details of fraction 3," p. 75.)

Estimation of solids in fraction 1 and 2 (F_{1+2}).—All the extracts from the first alcohol, ether, water, and final alcohol extractions are added together and if possible are kept in colloidal or, when warmed, in clear solution. (It may be necessary to dilute the alcohol with water to yield a more permanent solution.) This alcoholic extract is made up in a volumetric flask to proper volume. The volume is so adjusted to the weight of the fresh sample that the relation of volume to weight of sample is as 100 to 1—that is, for every gram of fresh sample there should be approximately 100 c. c. of alcoholic extract.

25-gram fresh sample=250 c. c. alcoholic extract.
50-gram fresh sample=500 c. c. alcoholic extract.

Anything over 50 grams should be made up to 1,000 c. c. (volumetric flask).

For the estimation of solids in this fraction either an aliquot part of the extract is taken for the larger samples (1,000 c. c.) or the entire extract of the smaller samples. (See below, p. 72, for drying this fraction.)

To obtain an aliquot part of the larger samples.—The above extract is warmed carefully on the steam bath until everything has gone into solution before making up to volume. When the solution has become uniform throughout, it is diluted to very near the mark with hot 95 per cent alcohol, well mixed,[1] and immediately after measured off, by means of the same pipette used for the mix-

[1] Precaution: Do not shake the flask containing the warm alcohol, as it is liable to boil over. The best way to mix the sample is to draw up a part of the solution into a warmed pipette and then, when some of the solution is removed from the flask, it may be shaken with safety. Allow the solution in the pipette to flow back gently into the flask. If this procedure is repeated several times one will get a uniform sample.

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ing; one-tenth, i. e., 100 c. c. of the 1,000 c. c. solution, is taken for the estimation of the total solids in fraction 1+2, as indicated below.

Drying of extract to determine solids.—The material for the estimation of solids, either the aliquot part measured off as indicated above or the entire extract, is now evaporated in weighed 9 or 11 cm. Jena glass evaporating dishes. The dishes should previously be dried from 12 to 24 hours in a vacuum desiccator before transferring the material into them for evaporation. In evaporating this material it is important to do so as rapidly as possible.[1] The evaporation may be hastened by drawing the vapors out of the dish by means of an inverted funnel connected with a suction pump. The greater part of the water, however, will remain behind. This is removed with great difficulty unless one-half to an equal volume of absolute alcohol is added from time to time. Finally the material in the dish should be of the consistency of a thick syrup, and when the dish is removed from the bath and the material allowed to spread over the side of the dish it should congeal. After the outside of the dish is wiped carefully it is placed in a vacuum desiccator containing granular $CaCl_2$ and dried to very nearly constant weight. This drying of the material, which is done in a vacuum to avoid oxidation as much as possible, will take from one to three weeks. It is necessary to evacuate the desiccator daily.[2]

SEPARATION OF FRACTION 1 FROM FRACTION 2.

(Into lipoid fraction (F_1) and water soluble extractives (F_2).)

Emulsifying process.—In case the extracts were made up to volume and a portion thereof was taken for estimating the total solids in F_{1+2}, the remaining nine-tenths may then at once be evaporated to a thick paste on the water bath to remove the alcohol (observing the same precautions as indicated on p. 72). This material may then be taken up immediately with water and transferred to a volumetric flask of proper capacity (applying the same proportions of fresh sample to volume of extract as indicated above, i. e., 1 to 100). If the material has been well moistened with water and all the alcohol has been removed previously by evaporation, it usually emulsifies readily, and is easily emulsified and transferred.

In case, however, the entire extract was evaporated to constant weight, it will take some time for the material to soften sufficiently to transfer it to the flask. It is therefore necessary to cover it with water and allow it to stand for some little time, preferably over night, if the weather is cool. In warm weather, however, it must be

[1] Precaution: Avoid overheating the material. The solution should never boil.

[2] Precaution: In applying the vacuum at first care should be taken to avoid loss by foaming or spattering of the semisolid material in the dish.

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worked off and on, with a glass rod to hasten the softening so that it can be transferred to the flask the same day in order to prevent decomposition of the lipoid material. (This emulsion should not fill the flask more than three-fourths.)

Lipoid precipitation.—To the emulsion (the flask must be shaken until every lump has disappeared and the emulsion is of uniform consistency) is gradually added, while shaking, a measured amount of concentrated HCl in the proportion of 1 c. c. for every 100 c. c. of solution. This is allowed to stand for a few minutes [1] and then a measured amount of chloroform is added—from two to four times the volume of the concentrated HCl; that is, for every c. c. of acid used from 2 to 4 cubic centimeters of chloroform are added. The volume of both the acid and chloroform should be recorded. The solution is now well shaken, thus giving the chloroform an opportunity to carry down with it the lipoid constituents of the emulsion. The solution is now diluted to the mark with distilled water at room temperature and again well shaken. The flask is now set aside in a cool place (ice box) and allowed to settle for 24 hours, or longer if necessary, until the precipitate and the filtrate form two distinct layers.

Final separation of F_1 *from* F_2.—The contents of the flask are now filtered through a dry ashless filter paper (placed in a dry funnel) into a dry glass-stoppered graduated cylinder of the same capacity as the flask. The filtrate should be clear. If the filtrate is not clear, it is an indication that not enough chloroform has been added in the beginning or not enough time has been allowed for the acid to precipitate the lipoid. The turbid filtrate in the cylinder, after the entire filtrate has been allowed to run through, must then again be shaken with a fresh quantity of chloroform (volume recorded) and again set aside in a cool place or directly in ice water. The same process of filtering is repeated. The volume of the final filtrate must be noted. (In filtering care should be taken to avoid transferring any of the chloroform layer to the filter paper, as it will pass through and cloud the filtrate and introduce an error.)

Details of analysis of fraction 1 (F_1).—This fraction is contained in the lipoid precipitate left on the filter paper in the funnel and also in the flask. To this lipoid precipitate a portion of the acid aqueous filtrate adheres. A correction for this adhering solution must be made later in the calculations in order to obtain the actual value of F_1. The total solids in this fraction (F_1) are obtained by the difference between the weight of F_{1+2} and F_2 (i. e., the total weight of the water and acid soluble material is subtracted from the total dry weight of fraction 1 and 2).

[1] It is very important that the acid is given sufficient time to precipitate the lipoids before the chloroform is added, as otherwise it is difficult to obtain a clear filtrate from this precipitation.

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The lipoid precipitate left on the filter paper and in the flask is now dissolved in alcohol, and portions of this alcoholic solution are taken for the estimation of:

(*a*) Total sulphur (see p. 78) and phosphorus (see p. 78).
(*b*) Total nitrogen (see p. 75).
(*c*) Total carbohydrates after acid hydrolysis (see p. 77).
(*d*) Total cholesterol (see p. 75).

To bring the lipoid precipitate into solution it is dissolved in hot alcohol. First the neck of the flask is washed down with a fine jet of hot 95 per cent alcohol, and then the funnel containing the paper with the precipitate is placed in the flask, and by perforating the tip of the filter-paper cone with a glass rod all of the precipitate may be washed down into the flask by means of hot alcohol. The filter paper and funnel must be washed perfectly free from any lipoid material by washing it with a fine jet of hot alcohol. Enough absolute alcohol is added in order to fill the flask about two-thirds full. This is now heated, with frequent gentle agitation, on the steam bath until the solution is uniform throughout.[1] The final mixing should be done with a warmed pipette, following the same directions as described in the earlier part of the paper, under the first distribution for solids (p. 71). When the solution is uniform throughout, it is diluted to very nearly the mark with hot 95 per cent alcohol, and after it is well mixed (see above) the proper sized samples are immediately measured off with a pipette for the various estimations (see below). The same pipette is used throughout the one distribution, and after the last distribution for that sample has been made it is rinsed with hot 95 per cent alcohol into the last fraction. All the measurements must be made at the same time and under the same conditions.

Details of analysis of fraction 2 (F_2).—This fraction is contained largely in the filtrate from the lipoid precipitate (F_1), with a small portion still adherring to the lipoid precipitate which must be corrected for in the lipoid fraction.

The solids in this fraction (F_2) are obtained by taking an aliquot part of the filtrate (100 c. c.) from the lipoid precipitate. This is evaporated to dryness on the water bath in a weighed porcelain crucible (5 cm. diameter) and dried in a vacuum dessicator to constant weight. In order to obtain the weight of total solids in this fraction a correction has to be made for the volume of chloroform which was added to the original water emulsion for the precipitation of the lipoid fraction. As the chloroform is dissolved in the lipoid precipitate and is not a part of the water extract, the total volume of the aqueous solution is reduced by the number of c. c. of chloroform which has been added originally. For example, if 100 c. c.

[1] Precaution: Do not shake the flask containing the warm alcohol, as it is liable to boil over.

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of the original water emulsion contained 2 c. c. of chloroform, then the filtrate from the lipoid precipitation would be reduced to a volume of 98 c. c.[1]

NOTE.—This correction for the chloroform must be applied to all the estimations made on this sample, such as for the estimation of sulphur, phosphorus, and nitrogen.

In the filtrate of known volume the following estimations are made on separate portions:

(*a*) Total solids (see above) and ash (see below).
(*b*) Total sulphur (see p. 79) and phosphorus (see p. 79).
(*c*) Total nitrogen (see below).
(*d*) Total inorganic sulphate (see p. 79).

(*a*) *Ash in* (F_2).—After the weight of F_2 has been obtained, the crucible is gradually heated over a free flame or by setting it inside a nickel dish or crucible and gradually heating at a low temperature until a white or light gray ash is obtained. This represents total ash in F_2.

Details of analysis of fraction 3 (F_3).—This fraction consists of the residue left from the alcohol, ether, water, and final alcohol extractions, and represents the protein residue. After this material has been brought to constant weight in the oven heated at 105° C., and the weight for total solids in this fraction is obtained, it is allowed to come to air-dry weight, and portions are taken for the following determinations:

(*a*) Total sulphur (see p. 79) and phosphorus (see p. 79).
(*b*) Total nitrogen (see below).

ESTIMATION OF CERTAIN CHEMICAL GROUPS AND ELEMENTS IN THE VARIOUS FRACTIONS.

1. ESTIMATION OF NITROGEN.

The total nitrogen is determined in fraction 1, 2, and 3, according to Kjeldahl-Gunning.

2. ESTIMATION OF CHOLESTEROL IN LIPOID FRACTION (F_1).

The aliquot part from the lipoid fraction (F_1), which was measured off at the time when the final distribution of this fraction was made and set aside, is now condensed and then dissolved in fifty times its volume of 95 per cent alcohol (hot). This is heated on the steam bath and then precipitated with 1 per cent solution of digitonin in slight excess (the digitonin is dissolved in 90 per cent alcohol so as

[1] The bulk of the volume of the lipoid precipitate is neglected, as it just about counterbalances the volume of chloroform lost by manipulation and the part that is in solution in the filtrate.

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to make a 1 per cent solution). After several hours the digitonin cholesterol is filtered off on a weighed Gooch crucible, washed with 95 per cent alcohol and ether and dried at 100° C and then weighed.

Calculation for cholesterol.—From the obtained weight the amount of cholesterol is calculated according to the following formula:

A : C=1589.06 : 386.15.
1589.06=Molecular weight of digitonin cholesteride.
386.65=Molecular weight of cholesterol.
A=addition product.
C=amount of cholesterol.

We therefore have:

$$C = \frac{A \times 386.35}{1589.06} = A \times 0.2431.$$

That is, one-fourth of the digitonin cholestrid is cholestrol.[1]

3. ESTIMATION OF LIPOID SUGAR IN F_1.

A definite amount (100 c. c.) of the alcoholic solution of the lipoid precipitate is transferred to a 2,000 c. c. round-bottom flask, the alcohol removed by evaporation on the steam bath and by sucking air through the flask by means of a suction pump. When all of the alcohol and chloroform has been driven off, 75 c. c. water, containing 3 c. c. concentrated HCl (sp. gr. 1.19), is added to the residue, so as to moisten the latter thoroughly. The flask is attached to a reflux condenser and heated on a perforated asbestos plate over a free flame for 24 hours. The solution should boil all the time. At first it may require some attention, as it is liable to foam, but later it can be left without danger of loss of material. The condenser is now removed and the material concentrated in the flask to about 40 c. c.; the residue is transferred to a pear-shaped separatory funnel and the aqueous layer is drawn off into a 100 c. c. volumetric flask. The 2-liter flask and fatty layer in the separatory funnel is washed four times with 10 c. c. portions of boiling water, after which the aqueous washings are added to the fluid in the volumetric flask. Finally about 2 grams of anhydrous Na_2SO_4 is added to clear the turbid solution, allowed to cool and neutralized to litmus by the addition of a 40 per cent solution of NaOH. After diluting to 100 c. c. the solution is filtered through a dry paper into a dry 100 c. c. cylinder. The volume recovered is noted. A correction is made later for the part of the solution which remains with the precipitate. The sugar content of this filtrate is then determined by means of Bertrand's method.

[1] Windaus, Zeitschr. f. physiol. Chem., 1910, LV, 113.

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ESTIMATION OF REDUCING SUGAR BY THE BERTRAND VOLUMETRIC METHOD.

The principle involved here is that a definite amount of Fehling's solution is boiled for a definite length of time under definite conditions as to dilution, with the sugar solution. The Cu_2O formed is filtered off, dissolved in an acid solution of ferric sulphate, and the ferrous sulphate formed titrated by a standard $KMnO_4$ solution. The titration then gives the weight of Cu_2O which has been oxidized. Knowing this, the amount of reducing sugar (calculated to glucose) can readily be determined from the Munson and Walker tables.

The details of the process are as follows: Equal volumes of Fehling's solutions (1) and (2), 25 or 50 c. c. of each, are carefully measured off into a 400 c. c. Jena glass beaker. To this is then added, while stirring, the neutral sugar solution and enough distilled water to make the total final volume twice that of the Fehling's mixture used. The beaker is covered with a cover glass, placed at once in a $CaCl_2$ bath which is boiling at 112° C. and heated in this boiling bath for exactly six minutes. The contents of the beaker should begin to boil in exactly four minutes and kept there for two minutes longer. Then immediately after removing from the $CaCl_2$ bath the solution is filtered through a properly prepared thick asbestos filter and washed well with hot distilled water. The filtrate should contain large amounts of unreduced copper.

The asbestos and precipitate is transferred as soon as possible to the beaker in which the precipitation was conducted. The precipitate is suspended in water, and then 10 c. c. N/2 $NH_4Fe(SO_4)_2$ solution is added, stirred until all of the Cu_2O is dissolved. All of the Cu_2O on the stirring rod in the funnel and on the sides and lip of the beaker should be dissolved. The solution is titrated at once, with continual stirring, until the pink due to $KMnO_4$ persists for about 10–15 seconds. 1 c. c. of N/20 $KMnO_4$, is equivalent to 0.00315 copper (gram). The amount of reduced copper is calculated and from this weight the amount of glucose is obtained by using the factor in the Munson and Walker's tables. (Bulletin 107 revised, U. S. Dept. of Agric., pp. 243–251.)

REAGENTS FOR ESTIMATION OF CARBOHYDRATES.

(1) *$CuSO_4$ solution.*—34,639 grams $CuSO_4.5\ H_2O$ (Baker's or Kahlbaum's best quality) are dissolved in water and diluted to 500 c. c.

(2) *Alkaline tartrate solution.*—173 grams sodium potassium tartrate and 50 grams best quality NaOH are dissolved in water and diluted to 500 c. c.

Equal quantities of these solutions are mixed and filtered just before using.

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(3) *N/20 potassium permanganate solution.*—3.14 grams potassium permanganate are dissolved in 200 c. c. distilled water (allowed to stand for two or three days, then filtered through asbestos or glass wool or the supernatant clear solution decanted into a clean dry bottle). Standardized against sodium oxalate, 0.10 to 0.15 gram sodium oxalate are weighed off for each titration. 1 c. c. N/20 solution is equivalent to 0.0035 gram sodium oxalate or 0.00315 gram copper.

N/2 Ammonium ferric sulphate in 20% H_2SO_4.—To 886 c. c. water add while stirring 114 c. c. conc. sulfuric acid. Dissolve 241 grams $NH_4Fe\ (SO_4)_2\ .12H_2O$ in a part of the above mixture and dilute up to 2,000 c. c.

(This solution can be made up roughly but it is important to have no ferrous salt present.)

ESTIMATION OF SULPHUR AND PHOSPHORUS. PREPARATION OF REAGENTS.

FOR SULPHUR DETERMINATIONS.

(1) *Fusion mixture.*—100 grams of potassium nitrate are ground in a mortar and added to 700 grams of sodium carbonate (use Baker's analysed or Kahlbaum's für analyse). The two salts are thoroughly mixed in a sieve from five to six times and kept in a dry stoppered bottle.

(2) *Barium chloride solution.*—200 grams of barium chloride are dissolved in 2,000 c. c. of distilled water and filtered if necessary.

FOR PHOSPHORUS DETERMINATION (VOLUMETRIC ANALYSES).

(1) *Magnesia mixture.*—110 grams of crystallized magnesium chloride ($MgCl_2:6H_2O$) are dissolved in 1,000 c. c. redistilled water; 280 grams of ammonium chloride are added; when all is dissolved 261 c. c. of ammonium hydroxide of specific gravity 0.90 and water enough to make the volume to 2 liters are added. This solution is filtered before using.

(2) *Ammonium nitrate solution.*—3,750 grams of ammonium nitrate (NH_4NO_3) C. P. are dissolved in 2,500 c. c. hot distilled water. Diluted to 5,000 c. c. with distilled water after cooling to room temperature. Filtered. (Where the directions state to use 15 grams of solid ammonium nitrate use 40 c. c. of this solution.)

(3) *Molybdate solution.*—100 grams of molybdic acid are dissolved in 144 c. c. of ammonium hydroxide, specific gravity 0.90, and 271 c. c. of water. This solution is poured slowly and with constant stirring into the mixture of 489 c. c. of nitric acid (specific gravity 1.42) and 1,149 c. c. of water contained in a large porcelain dish.

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The mixture is kept in a warm place for several days or until a portion heated to 40° deposits no yellow sediment, and preserved in glass-stoppered bottle. Before using a portion of this solution for the precipitation of PO_4, 5 c. c. of concentrated nitric acid (sp. gr. 1.42) is added to each 100 c. c., mixed well and filtered.

(4) *Ammonium nitrate solution for washing precipitate.*—200 grams ammonium nitrate are dissolved in 2,000 c. c. of water.[1]

(5) *N/2 or N/10 sodium hydrate solution.*

(6) *N/2 or N/10 sulphuric acid solution.*

(7) *Phenolphthalein (indicator).*—Use 1 c. c. of neutral solution for each titration.

Total sulphur and phosphorus by fusion with sodium carbonate and potassium nitrate.—The sample, which is either weighed off (F_3) or measured off (F_1 and F_2), is mixed intimately with 15 parts fusion mixture by weight and transferred to either a nickel or silver crucible of 30 to 60 c. c. capacity. The mixture in the crucible is covered with a layer of fusion mixture. The cover is placed on the crucible and the material very gradually charred over an alcohol lamp, starting with a very low flame which is gradually raised until the alcohol flame almost touches the crucible. This charring should be conducted so slowly that at no time smoke fumes escape from the crucible, nor should the layer of the fusion mixture on top become more than just faintly discolored. Should the fumes come off too rapidly, the alcohol lamp must be removed for a short time and fresh fusion mixture sprinkled on top. This process of oxidizing the organic material may take from a few hours to several days.

After the material has been completely charred the mass, after cooling, is thoroughly ground up in a glass mortar with the addition of 1 to 2 grams of fresh fusion mixture and replaced in the same crucible with a fresh layer of fusion mixture on top. It is then heated with a Barthel or special Rogers burner at a temperature sufficiently low to avoid caking the fusion mixture. (The combustion will be more complete after heating at moderately low temperature for half an hour than by trying to force the process, for any caking is apt to include black specks, which are difficult to oxidize, and not only may contain unoxidized sulphur but also actually reduce some of the sulphates already formed.) The fusion mixture is then broken up with a platinum spatula while hot, and when cool is transferred to a 500 c. c. Jena Erlenmeyer flask. The empty crucible is then placed in a small beaker and twice boiled out thoroughly with hot water and the washings from this added to the original contents. A funnel is inserted in the top of the Jena flask containing the fusion mixture to prevent loss from spattering and

[1] Dilute this with 9 volumes of water before using.

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then concentrated HCl (sp. gr. 1.19) is added cautiously to the solution. Not more than 5 c. c. acid is added at a time to prevent foaming, but care must be taken to have an excess of acid (10 c. c.) at the end. The solution is next heated on a water bath to drive off the carbon dioxide evolved, then transferred to a 600 c. c. Jena beaker and evaporated to dryness on a water bath (this water bath should be placed in a hood where the fumes are drawn off). When completely dry 20 to 24 c. c. concentrated HCl are added and again evaporated to dryness. This acid treatment is repeated and again evaporated to dryness. The mass of salts is now dissolved in about 400 c. c. of water, to which 10 c. c. concentrated HCl have been added, and this solution is then filtered through an ashless filter paper into a clean Jena beaker of same capacity. Both beaker and filter paper are thoroughly washed, adding the washings to the filtrate. The volume of the filtrate should be so adjusted that there is about 20 c. c. of solution to 1 gram of fusion mixture originally used.

The solution is now heated to boiling on an asbestos-covered gauze and to the boiling solution is added gradually drop by drop 10 c. c. of a 10 per cent $BaCl_2$ solution. (A Folin dropper, $CaCl_2$ tube drawn out, is convenient for this purpose.) The beaker is covered with a watch glass and set aside on a boiling steam bath for 10 to 12 hours and then allowed to stand in the cold for another 36 hours, making 48 hours altogether.

It is usually considered advisable in making a sulphate estimation to obtain a weighing of 100 mgm. or more of barium sulphate. As this would involve the destruction of very large amounts of organic material it was decided in these analyses to aim at 40 to 60 mgm. of barium sulphate. The amount of the original moist sample and the aliquot parts taken are adjusted so as to conform to this requirement.

Finally the barium sulphate precipitate is filtered, after 48 hours standing, through a 9 or 11 cm. ashless filter paper. The last traces of barium sulphate are removed by means of a rubber policeman and the precipitate washed well with distilled water. The final washings should test free from chlorides. (Test a few c. c. of the washings by means of silver nitrate, to which a few drops of nitric acid have been added.) The paper with the precipitate is transferred to an ignited weighed porcelain crucible. The paper is gradually charred in the crucible with a gentle flame and finally burned to a white ash. The barium sulphate is weighed.

Calculation for sulphatides:

$$\frac{\text{Lipoid sulphur} \times 50}{\text{Weight of dry substance}} = \text{Per cent of sulphatides in dry substance.}$$

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ESTIMATION OF PHOSPHATES IN THE FILTRATES FROM THE $BaSO_4$ PRECIPITATE.

The filtrates and washings of the $BaSO_4$ precipitate are concentrated to about 200 to 3,000 c. c. in a beaker. This evaporation must not be carried to such a point, however, that the salts begin to crystallize out. Now this solution is just neutralized with NH_3, and to the cold solution 10 c. c. of magnesium mixture is gradually added while stirring.

Finally, while stirring, 15 c. c. of strong NH_3 (sp. gr. 0.90) for every 100 c. c. of solution is added. The solution is allowed to stand 24 hours in a cool place, then filtered through filter paper and washed twice with cold 2.5 per cent NH_3 water. Dilute strong NH_3 (sp. gr. 0.90) with 9 volumes of distilled water. The precipitate is dissolved in the beaker in hot 10 per cent nitric acid solution and filtered through same filter into a 500 to 600 c. c. Florence flask and washed well with hot distilled water into the same flask. The final volume of the filtrate should be about 80 to 100 c. c. The filtrate is just made alkaline with strong NH_3 (sp. gr. 0.90) and then again acid by the addition of nitric acid. Then add 1 c. c. 10 per cent nitric acid in excess and 20 c. c. of the strong NH_3 (NO_3) solution (20 c. c.= 15 grams NH_4 (NO_3)) is added, well mixed and heated to 65° in a bath kept at 65 to 68° C.

The proper amount of freshly acidified molybdate solution is prepared by adding 5 c. c. concentrated nitric acid (sp. gr. 1.42) to each 100 c. c. of molybdate solution, mixed and filtered. Now 25 to 50 c. c. of this molybdate solution is gradually added while keeping the contents of the flask agitated by rotation. The flask is replaced to bath and kept there for 15 minutes. (If the molybdate solution is made of the proper strength, according to directions, 25 c. c. should be enough to precipitate 0.015 gram phosphorus calculated as P.)

The yellow ammonium phospho-molybdate precipitate is now at once filtered off through either asbestos (Gooch) or paper filters (testing for complete precipitation by adding a fresh amount of ammonium nitrate and molybdate solution to the filtrate and reheating in water bath). The precipitate is well washed with 1 per cent ammonium nitrate solution until neutral to litmus, and finally once with distilled water. The filter (either asbestos or paper) with precipitate are now returned to the flask by means of a glass rod and a jet of cold distilled water. To the mixture in the flask a N/2 or N/10 solution of NaOH measured from a burette is added until the yellow precipitate is completely dissolved. There should be from 5 to 10 c. c. of alkali in excess. One c. c. of the neutral phenolphthalein solution is used as indicator and titrated back with either

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N/2 or N/10 sulphuric acid until the red color just disappears. The solution should not stand in the NaOH for any length of time. The acid titration is carried out as soon as the precipitate is dissolved. The difference between the sulphuric acid and the NaOH represents the amount of either N/2 or N/10 NaOH used to neutralize the insoluble acid precipitate $(NH_4)_3PO_412MoO_3$.

One c. c. N/2 NaOH is equivalent to 0.6742 mg. phosphorus.

One c. c. N/10 NaOH is equivalent to 0.13584 mg. phosphorus.

In case the amount of phosphorus is very small N/10 solutions are used in the titrations.

Calculation of phosphatide: On the basis that 0.388% of the phosphatide consists of phosphorus, the phosphatide value is obtained by multiplying the total lipoid phosphorus found by 25.77.

CASE HISTORIES.

Case N I. (Control. Encapsulated empyema. Acute peritonitis.) D. M. W.; male; white; 48 years of age. Admitted to Johns Hopkins Hospital February 11, 1914.

Complaint on admission: Pains in arms, legs, and right side.

Family history: Negative.

Personal history: Occasional "sick headaches," "morning cough" for some time. Urethritis 30 years ago. Patient's illness began six months ago. Pains in limbs; and sharp pain, accentuated on inspiration, in right side. Tonsillectomy 2½ weeks before admission. Prostatic examination, negative. Heart, practically negative.

W. B. B., 6,360; H. C., 82. Differential count, normal. Wassermann, negative. Temperature, elevated. Nose and throat, negative, except for slight opacity of right antrum.

February 22: Sharp pain in lower right axilla, slight dullness, few crackles, friction rub present. W. B. C., 12,000. Later flatness made out. Puncture, lower right axilla given only few drops of blood. Sputum not blood tinged. No tubercle bacilli. Gram positive diplococcus present.

February 24: W. B. C., 15,800. Some tubular breathing now present. Impression, pneumonia.

February 27: Friction rub notes on left front. B. S. less tubular over lower right. X ray, spotty infiltration of both lungs, unusual shadow in right upper mediastinum, probably dilated aorta. Blood culture negative; slight tachycardia; tremor and exophthalmos noted.

March 2: Sputum shows great numbers of gram positive cocci in groups; also yeast like organisms.

March 3: Marked dullness over upper right. Few râles at apex of lower left lobe. Sputum purulent; suggests staphylococcus septicemia.

March 5: Flatness over right upper back.

March 7: Oedema of upper lip. Tongue swollen, few hemorrhages.

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March 8: Tracheal râles. Breath slightly foul odor.

March 9: Foul odor more marked. Died at 7.20 a. m. Blood cultures negative; gram positive staphylococcus cultivates from sputum. Urine culture also staphylococcus.

NECROPSY.

ANATOMICAL DIAGNOSIS.

Subacute proliferative pleurisy and encapsulated empyema right and middle lobes; acute general fibrinous peritonitis; beginning acute pericarditis; atelectasis of right upper lobe; acute bronchitis (bilateral); bronchopneumonia; cloudy swelling of liver; slight chronic diffuse nephritis; slight enlargement of prostate (middle lobe); slight bilateral hydronephorosis; ulceration of lips and tongue; slight anterio-sclerosis involving coronaries; acute splenic tumor; acute bronchial lymphadenitis. Slight acute cholecystitis; slight bronchiectasis (right); fatty liver; hemangioma of liver; localized colloid goitre.

Body.—That of a well-nourished white man, 168 cms. long. Pupils are equal and not dilated. There is no discharge from the ears and nose. The lips, especially the upper lip, are very much swollen. On opening the mouth there is found to be a considerable quantity of purulent-looking material present. On the interior surfaces of both lips are a number of round lesions, consisting of ulcerated areas in the mucosa and mucous membrane, surrounded by a certain amount of injection and induration. Along the borders of the tongue are other lesions marked principally by redness where the ulceration is not extensive. The teeth are in a good condition. In the right axilla are seen two small, slightly reddened and slightly elevated papules, which are said to be the result of burns due to local application. In other parts the external surface of the body shows nothing of pathological interest. On opening the abdominal cavity there is found to be a considerable amount of thick, yellow, rather tenacious mucoid exudate over the peritoneal surfaces of the liver and intestine. The entire peritoneum is very slightly injected. This injection is a trifle more marked, perhaps, around the region of the cæcum. The amount of exudate is perhaps a trifle greater in the upper part of the abdomen, and there is a considerable quantity of it on the upper surface of the liver between the liver and diaphragm. The abdominal organs are in a normal position. On opening the chest the right lung is seen to be adherent over almost its entire surface, and on making the incision an abscess cavity containing a considerable quantity of creamy, slightly greenish-yellow pus is opened into. The left pleural cavity is free of adhesions and contains no excess of fluid, but the pleural surfaces are everywhere markedly injected and granular. On opening the pericardial cavity the heart is not markedly enlarged. There are no adhesions and no excess of fluids. At one or two places in the pericardium there is seen a very slight injection of the small vessels, but no exudate made out. The epicardial fat normal in amount. Consistence of the heart is firm.

Heart.—Weighs 375 grams. The right auricle shows a smooth intimal surface. There are no adherent clots. The foramen ovale is closed. The tricuspid orifice measures 11 cms. The tricuspid valve is thin and delicate and appears competent. The right ventricle is not dilated or markedly hypertrophied. The wall measures about 6 mms. in thickness. No mural thrombi seen. The aortic ring measures 8 cms. The valves are thin and delicate. The pulmonary artery shows no sclerosis. The left auricle shows a smooth and pale intima. No adherent thrombi in the apex. The mitral ring measures 10½ cms. The mitral valve shows a very slight thickening along the line of closure and the chordæ

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tendineæ, but there is no irregular shrinkage or any sign of an acute process. The left ventricle is not dilated. The walls average 16 to 17 mms. There are no mural thrombi. The aortic ring measures 8 cms. in circumference. The aortic valves are thin and delicate. In the beginning of the aorta and also in the lower surface of the aortic leaflet of the mitral valve are a few yellow atheromatous patches. The coronary arteries also show a few of these yellow, slightly elevated, atheromatous patches, but at no place is their lumen seriously interfered with. The heart muscle on tangential section shows no patches or lesions. Later examination shows a few very small speaks on the mitral valve, with little reddening, suggesting vegetations. Saved for section.

Lungs.—Left lung: The pleural surface of the left lung shows everywhere a fresh, acute pleurisy with injection and a slight amount of fibrinous exudate. Here and there on the surface are seen a few small, inconspicuous, gray plaques surrounded by little pigmentation. On section these plaques are very thin, involving only the pleura. Along the free edges the lung is rather pale. On section the lung shows a smooth but dark and rather moist surface. All parts of the lung are air containing. A few definite areas of localized consolidation, which are elevated above the surface and granular in character, are found, especially in the lower part of the upper lobe.

Right lung is everywhere adherent to the parietal pleura. The abscess above described lies below the free edge of the lung and is closed by the diaphragmatic pleura on one side and the parietal pleura on the other side. It does not extend through or into the diaphragm. On dissecting around this lung with the fingers other cavities are opened into, one of these being on the median aspect of the lung adjacent to the anterior mediastinum. None are found over the lateral surface of the lower lobe, but at the upper border of the lower lobe, opposite the middle lobe, a large one is opened into. From this point upward almost the entire surface of the lung is occupied by large masses of purulent material lying between the parietal and visceral layers of the pleura. The process is evidently of some age, since there are firm adhesions present. In order to avoid tearing the lung the parietal pleura is removed with it. On making a coronal section through the lung from apex to base it is found that the above-described masses of pus lie entirely between the two layers of pleura and do not invade the lung at any point. Those around the upper lobe are so large and occupy such a large quantity of material that the upper lobe is compressed and atelectatic. Its surface is smooth, dry, and not granular. The middle lobe shows less compression, while the lower lobe resembles the lung tissue in the right lung, except that fewer definite areas of bronchopneumonia are made out. The pleura, at points where it is not involved by the purulent process, is thickened and covered with tags of fibrinous adhesions. These adhesions have definitely circumscribed areas of inflammation, above described. These cavities between the two layers of pleura contain a large quantity of material, which is of two kinds, namely, creamy, greenish-yellow pus and yellow, rather tenacious, and elastic masses of fibrin. At some places over the outer lobe this material separates the two areas of pleura for a distance of 2 cms. On stripping away the exudate from the pleural surface this surface is found to be exceedingly red and angry looking. On section through the pleura it is seen to be thickened. The lower layers of it are gray and fibrous, whereas the upper layers are very vascular and soft. The bronchi are opened very carefully throughout the entire lung and at no place communicate with the empyema cavities. Their inner surface is somewhat injected and covered with an abundant layer of blood-tinged muco-purulent material. The pulmonary vessels show no abnormality.

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Spleen.—Weighs 150 grams; measures 11½ by 7½ by 3½ cms. The capsule is smooth and not thickened. There is not very much of the fibrinous exudate about the spleen. On section the spleen pulp is about normal in consistence. The cut edge stands out at a right angle. The pulp can not be very readily scraped off on the knife. The Malpighian bodies are prominent as gray, translucent dots. The fibrous tissue is not very much increased.

Stomach.—Contains a large quantity of bile-stained fluid. The mucosa is everywhere smooth and intact. There is no marked area of injection—probably the mucus is somewhat increased.

Duodenum.—Shows a little pigmentation just at the pylorus. Aside from this, it has intact and normal looking mucosa. Bile is readily expressed into the papilla. The pancreatic duct opens with the bile duct at the papilla. The bile and pancreatic ducts show no evidence of stenosis or inflammation. The gall bladder contains a small quantity of green, viscid bile. On incising it, the mucous membrane is seen to show a slight but definite injection of the blood vessels. On the outside of the gall bladder are a number of fibrous adhesions which bind it to the duodenum and also to a lesser extent to the colon.

Pancreas.—Is normal in size, position, and gross appearance.

Liver.—Weighs 1,640 grams; measures 24 by 18 by 7 cms. The external surface of the liver is everywhere smooth and glistening. The lobulation is everywhere to be made out. One or two tiny yellow specks are seen here and there. On the upper surface of the liver are three or four small, slightly depressed, very dark, almost black areas. On section through these areas they are found to extend some distance into the liver tissue and are composed of apparently fibrous tissue, which seems to be porous and does not resemble the liver parenchyma around. One or two of the interstices of this fibrous tissue contain blood clots. The upper surface of the liver especially is reddened and covered with a layer of buttery exudate, above described. On section the lobulation is not very distinct. The liver as a whole is rather pale and yellowish and has an opaque, cloudy appearance. Small yellow specks, above described, are also to be seen on the cut surface of the liver. They are not numerous. The portal zones of the lobule are slightly more lighter colored than the central zone, but there is no evidence of fibrosis to be made out.

Adrenals.—Are normal in size and gross appearance.

Kidneys.—Left kidney weighs 175 grams. The capsule strips readily, leaving a slightly granular surface, on which are found several small retention cysts. Also at one point on the surface of this kidney is a small yellow speck which is not elevated above the surface and extends only a short distance into the cortex. The fetal lobulation is well marked. On the anterior aspect of the pelvis kidney tissue is more deficient than normal, failing to cover the pelvis at this point. On section through the kidney the tissue seems to be thinner than usual. This perhaps may be due to the malformation mentioned above. The space around the pelvis usually occupied by the medullary rays is filled in with fat. The cortex averages 6 or 7 mms. in thickness. The striations are prominent. The color is slightly dark. The glomeruli are made out with difficulty. The striations are prominent and not irregular. The pelvis is definitely dilated, but shows a smooth and pale mucosa. It measures about 1½ cms. in width. The right kidney resembles the left in every respect except that its disposition about the pelvis is normal. In this kidney the dilatation of the pelvis is also noticed. The ureters are opened from kidneys to bladder and show no obstruction or other lesion at any point.

Pelvic organs.—Bladder is not dilated nor hypertrophied, and shows a smooth, pale mucosa. There is a slight grade of hyperemia at the urethral orifice.

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The median lobe of the prostate is slightly enlarged and projects as a small, rounded lump into the urethral lumen to the extent of about 8 mms. The remainder of the prostate is slightly enlarged and firm, but does not seem to have interfered with the urethral lumen to any great extent. On section there is a considerable amount of fibrous tissue to be seen and a quantity of prostatic sand. The seminal vesicles show no marked adhesions or thickening, no sign of acute or chronic inflammation in the gross. The testicles show no adhesions or fibrosis and appear normal. Rectum shows a few fibrous tags about the anal orifice. Aside from this there is no stenosis or inflammation. The solitary follicles are visible but not enlarged or ulcerated.

Neck organs.—The lesions above described lying in the tongue are found to be principally along the margin. On incising them it is seen that the infiltration and injection extends for some distance into the tissues of the tongue. There is no ulceration nor pus formation to be made out. The pharynx and epiglottis present nothing abnormal. The trachea is not injected but contains a considerable quantity of blood-stained mucus. Œsophagus shows a smooth, pale mucosa throughout. Thyroid is slightly enlarged. On section the thyroid tissue appears normal everywhere except in the right lobe, where there is a circumscribed area in which the alveoli are much enlarged and contain quantities of colloid material. The mediastinal lymph glands are considerably enlarged, soft and gray in appearance. There is no caseation to be seen.

Aorta.—Shows a few superficial atheromatous patches, but retains its elasticity throughout.

Brain.—Is not removed. Spinal cord is removed throughout its entire course and shows no gross abnormality. It is saved for chemical analysis.

Intestines.—Throughout show a smooth, normal-looking mucosa. The solitary follicles are somewhat prominent in the cæcum but do not seem to be ulcerated. The appendix does not show any marked adherence to the surrounding tissue and is not inflamed.

Cultures.—On various media are taken from the lung pleura and peritoneal exudate. Smears made from these various exudates show large numbers of small cocci, often arranged in chains.

MICROSCOPICAL NOTES.

Left lung.—A little localized broncho-pneumonia.

Right lung.—Upper lobe shows atelectasis and a certain amount of desquamative pneumonia.

Pleura.—Is much thickened, showing subacute inflammation, with organization below; fresh granulation tissue and fibrinopurulent exudate above. At several points pleura is separated into two layers by large or small collections of this exudate. Elsewhere there is complete synchia of the parietal and visceral pleuræ. The pus shows tendency toward necrosis and nuclear fragmentation. Only a few scattered cocci are to be seen in the exudate. Very rarely a small clump. In smears, however, bacteria are numerous, being very small cocci arranged in masses, pairs, and short chains (not over 6).

Bronchi show polymorphonuclear infiltration of the mucosa, and are filled with purulent exudate. A little broncho-pneumonia around some of these inflamed bronchi.

Spleen.—Congestion. Many large mononuclears but little phagocytosis.

Liver.—Shows advanced fatty change; no necrosis. Over capsule is a fibrinopurulent exudate like that on the pleura. There are a number of small, multilocular hemangiomata in the liver sections.

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Gall bladder.—Slight injection of mucosal vessels.

Kidney.—Slight amount of fibrosis. Moderate number hyaline glomeruli. Few small triangular subcapsular scars.

Tongue.—Shows phlegmonous polymorphonuclear infiltration of all the tissue. Clumps of cocci are seen, but they seem larger than those described above. At several points, beginning ulceration of epithelium.

Thyroid.—Localized area of colloid goiter.

Lymph glands.—Especially hilic; show congestion and enlargement (subacute). In one there is large central area of coagulative necrosis, with practically no reaction about it. No other necroses seen.

In voluntary muscle cut from leg, where pain was complained of; muscle cells which are enlarged homogenous, translucent, and light colored. Certain areas of the muscle show atrophy of the fibers, with increase of the sheath nuclei and a few round cells. Diagnosis, slight myositis, with atrophy.

Case N. II. (Control. Cerebral hemorrhage.) D. A. H.; male; white; 40 years of age; single. Admitted to Johns Hopkins Hospital April 21, 1914, 5 p. m.

Family history: Negative.

Personal history: General health good.

The night before admission fell downstairs. Picked up unconscious; regained consciousness within an hour; walked about; complained of severe headache and lapsed into coma again about four hours later. After that, frequent convulsions, beginning on left side of face, head turns to left. Slight deviation of eyeballs to left, more pronounced in convulsions. Much mucus in pharynx. Coarse râles in lungs. Reflexes exaggerated in arms, especially right. Abdonimals absent. Cremasteric not definite. K. K. exaggerated, about equal. Ankle jerk active, no clonus. Babinski negative. Oppenheim absent on left, slow dorsal flexion on right. Temperature 106° F.

Lumbar puncture 6.40 p. m.: Bloody fluid, 280,000 red blood cells, 600 white blood cells, mostly polymorphous. Repeated post mortem—4,000 red blood cells, 30 white cells. Blood count—4,400,000 red cells, 10,500 white cells, hemoglobin 80.

Urine contains albumin and casts.

Died 7.30 a. m. without improvement and return to consciousness. Diagnosis, cerebral hemorrhage.

NECROPSY.

April 22, 1914, 11 a. m.

ANATOMICAL DIAGNOSIS.

Cerebral hemorrhage, bilateral, frontal (traumatic, apoplexy?), subdural hemorrhage; multiple cortical hemorrhages; extradural hemorrhages; purulent bronchitis; broncho-pneumonia; fatty change and central necrosis, liver; arteriosclerosis; milky patches; slightly enlarged prostate; hypophyseal cyst.

Body.—Is that of a well-nourished white man, 163 cms. long. Pupils are almost equal and very slightly irregular. Nothing of interest on the exterior of the body, except that lumbar puncture wound is seen. On opening the body there is a normal amount of subcutaneous fat. The peritoneal surfaces are everywhere smooth and glistening. The viscera lie in a normal position. There is no excess of fluid. On opening the chest no free fluid in the pleural cavity. The heart is not enlarged and lies in a normal position. No excess of fluid in pericardial cavity. Pericardial surfaces are everywhere smooth and glistening.

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Heart.—Weighs 360 grams, small and contracted, having evidently stopped in systole. Over the visceral pericardium are a number of small, gray, slightly depressed scars. On section these scars are seen to extend some little distance into the myocardium. The epicardial fat is normal in amount. The left auricle has a smooth and glistening endocardium. The foramen ovale has a slitlike opening. Beneath the endocardium are spots of yellowish material resembling fat. The tricuspid ring measures 12½ cms. The leaflets are thin and delicate. The right ventricle is not dilated nor hypertrophied. Just beneath the endocardium are yellow, nonelevated patches having the appearance of fat. They do not extend very far into the myocardium. No adherent thrombi. The pulmonary ring measures 7½ cms. The valves are thin and delicate. The left auricle presents a smooth, normal appearance. The mitral ring measures 9 cms. The mitral valve is delicate and appears competent. The cavity of the left ventricle is reduced in size. The wall averages 15 mms. The aortic ring measures 7½ cms. The valves appear competent. Just above the aortic arch are a few small, yellow, opaque, slightly elevated atheromatous patches. The coronary arteries are smooth and elastic.

Lungs.—Left lung: The pleural surfaces are smooth and glistening, except for a few old fibrous adhesions surrounding the upper and outer margin. The lung crepitates throughout. A few enlarged alveoli near the free margin are seen. On section both lobes, especially the lower, shows numerous, rounded areas which are dark red in color and slightly elevated above the cut surface, slightly firm and granular. The bronchial mucosa is somewhat injected and the bronchi are filled with a large amount of muco-purulent material, which interfers with the escape of air from the lung. The pulmonary vessels show no thrombus. Right lung resembles the left in every respect.

Spleen.—Weighs 75 grams; measures 8 by 6 by 2 cms. There are no adhesions about it. The capsule is slightly wrinkled. On section the pulp is rather firm and contracts slightly on the cut edge. The trabeculæ are very prominent. The Malpighian corpuscles are seen as small, gray dots. The pulp is not abundant and does not scrape off readily on the knife.

Stomach.—Is not enlarged nor dilated. The mucosa is everywhere intact. Beneath it are seen a number of small, punctate hemorrhages. Duodenal mucosa also presents a normal appearance.

Pancreas.—Is normal in size, position, and gross appearance. The bile and pancreatic ducts open together into the ampulla. Neither shows any inflammation or stenosis. Gall bladder is filled with green, viscid bile. No gall stones. At the hilum of the liver are a few lymph glands showing gray pigmentation.

Liver.—Weighs 1,900 grams; measures 26½ by 21 by 7 cms. It is rather firm and brittle in consistence. The capsule is everywhere smooth and glistening. The liver has a distinctly bright yellow tinge. On section this yellowish color is accentuated. The cut surface has a rather greasy, opaque appearance. A good deal of greasy material scrapes off on the knife. The lobulation is rather indistinct. The hepatic area is slightly darker than the portal.

Adrenals.—Are normal in size, position, and gross appearance.

Kidneys.—Left kidney weighs 185 grams; measures 11½ by 6½ by 3½ cms. The capsule strips readily leaving a surface that is perhaps slightly granular and rather pale in color. No hemorrhages are seen. There are a few small retention cysts filled with clear fluid. On section the pale color of the kidney is noticeable. The cortex averages 6 mms. in thickness. The striations are regular and normal. The glomeruli are seen as tiny red dots. The pelvic mucosa is pale and normal in appearance. Right kidney resembles the left in every respect.

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Pelvic organs.—The bladder is rather contracted but not hypertrophied. The mucosa is wrinkled and considerably injected, especially about the trigonum. No hemorrhages or ulceration seen. The prostate shows a slight degree of enlargement, especially in the middle lobe, so that there is somewhat more acute bend than usual in the prostatic urethra. The prostate on cross section presents a normal appearance, except for a few small cysts. No calculi are seen. Urethra shows a slight degree of injection. The rectum shows no ulceration or stenosis.

Oesophagus.—Shows a smooth, pale mucosa throughout. The trachea is not injected, but contains a considerable quantity of muco-purulent material.

Aorta.—Is fairly elastic, but the intima has a large number of yellow, opaque, slightly elevated patches, especially in the abdominal portion.

Intestine.—Shows an area in the cæcum where there is a very marked injection with numerous submucous ecchymoses.

Brain.—On opening the dura a large quantity of bloody fluid gushes out. When most of this is washed away and the brain removed it is found that there is much blood over the convexity of the brain, lying free, and also within the pia. There is a good deal more of this hemorrhage on the left side, and it also extends to a lesser extent down to the base of the brain. The anterior poles of both frontal lobes are definitely softened to the touch; on the right side there is an opening into a large ragged cavity in the substance of the frontal lobe. Fresh blood clots protrude from this opening. On making transverse sections of the brain, about 1 cm. apart, it is found that this cavity on the right side extends back to a point directly above the optic chiasm. The cavity is about 2 cm. in diameter, has deflected the median septum slightly to the left, pushed the head of the caudate nucleus in the same direction, and compressed the lateral ventricle. On the left there is a similar but smaller cavity, also filled with fresh blood clot, which has not opened to the outside and which extends back about 3 cms. from the anterior pole of the left frontal lobe. It has not caused marked distortion of architecture. Further, on this side there are two small cortical hemorrhages of the lateral surface of the temporal lobe about where it merges with the occipital. In the substance of the pons, opposite the middle cerebellar peduncle, is a small hemorrhage, about 1 mm. in diameter. On incising a swelling of the dura noted in the right cerebellar fossa, there is found an extra dural blood clot about 2½ to 3 cms. in diameter. No gross disturbance of the bony parts is seen. The hypophysis contains a cyst 3 to 4 mms. in diameter, filled with nonfluid colloid material.

MICROSCOPICAL NOTES.

Heart.—Some fibers seem a little hypertrophied; otherwise negative.

Lung.—Numerous well-demarcated areas of bronchopneumonia, in some of which the exudate is almost entirely red-blood cells, in others almost entirely white-blood cells, evidently of varying ages. Numerous pigment-laden phagocytes in alveoli. Bronchi show desquamation and infiltration of mucosa with polymorphonuclears, lumen filled with pus.

Spleen.—Congestion.

Liver.—Extreme fatty change throughout lobule, most marked in peripheral zone. In many lobules, beginning central necrosis, with deep red staining cells, the nuclei of which are still seen, though often pyknotic and irregular. In some places granular degeneration of cytoplasm.

Brain.—Section through wall of hemorrhage cavity in frontal lobe show massive hemorrhage; all about edge great numbers of small extravasations

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everywhere throughout brain tissue. No reaction whatever about them. Blood cells perfectly preserved.

Cord.—Negative except for a little blood in subdural space.

Hypophysis.—Shows wall slightly thickened and fibrous, of cyst, which contains colloid material. Numerous smaller colloid cysts. Otherwise appears normal.

Case N. III. (Control. Tuberculous peritonitis, generalized tuberculosis.) A. H.; male; negro; 20 years of age. Admitted to Johns Hopkins Hospital March 28, 1914.

Complains of "trouble with stomach and back; pain after eating."

Family history: Unimportant.

Personal history: Negative.

Present illness began six weeks before admission, with intermittent sharp pains in lower abdomen, followed by vomiting several times during the next few days. After this he was quite well until one week before admission, when he again vomited, this time after eating. Since this time has eaten only crackers and milk. Constant pain in abdomen. Cough for the past two weeks. Lost 10 pounds in weight. P. E. Extreme emaciation, dyspnœic, and tachynœic. Mucous membranes pale. Distinct general glandular enlargement. Pleuritic friction rub on left side. Crackling râles at apex, right axilla. Retro manubrial dullness. Abdomen moderately distended; boardlike rigidity, shifting dullness in flanks. Tenderness. A rounded, fluctuant swelling over right wrist. On admission temperature was around 102°, later became remittent, with evening elevations. Before death was subnormal for a few days. Leucocytes 6,000 to 7,000. Red cells normal. Hb., 80 per cent; B. P., 110. Albumin present in urine. Wassermann negative. Calmette test, 5 per cent positive. X-ray examination, no bony change in right wrist; lungs clear, except very slight clouding of left upper.

Impression: Tuberculous peritonitis; acute fibrinous pleurisy, right side; tuberculous tenzosynovitis; patient refused to eat and emaciated rapidly. Gradually died from exhaustion.

NECROPSY.

(April 25, 1914—4 p. m.)

ANATOMICAL DIAGNOSIS.

Tuberculous peritonitis, with intestinal perforation (lower third ileum); enlarged caseous peribronchial lymphglands; generalized tuberculosis; bilateral fibrinous pleurisy, tuberculous cloudy swelling of viscera; emaciation. Tuberculous cavities of liver.

Body.—Is that of an extremely emaciated negro man 165 cms. long. Rigor mortis is absent. Pupils are equal and dilated. The conjuctivæ and mucous membranes are extremely pale. Ears and nose are apparently normal. Teeth are in a moderately good condition. Throat negative. Head is normally formed. The skin of the body is in a fair condition. No scars nor ulceration seen. Thorax is long, otherwise normally developed. Abdomen is scaphoid and symmetrical. There is no œdema of the extremities. The genitalia are normal. The lymphglands are enlarged and easily palpable. On the ulnar surface of the right wrist there is a small, rounded swelling about 8 by 4 cms. in dimensions, which is fluctuant and is apparently in the soft parts, as no bony involvement can be made out. On opening the abdominal cavity the

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intestines are noted to be matted together with adhesions and everywhere adherent to the abdominal wall in many places, so adherent that it is difficult to open the abdominal cavity without opening into the intestines. In the lower portion of the abdomen a large amount of greenish, fecal-smelling material is present. Over the surface of the intestines there are large, white, caseous patches elevated, measuring from 3 mm. to 1 cm. in diameter. The intestines are everywhere matted together. It is impossible to separate them from the stomach or the stomach from the liver. Just about the brim of the pelvis there is a definite opening in the lower third of the ileum. This opening is about 1 cm. in diameter. Except for the fecal material in the abdominal cavity, there is no excess of fluid. It is tuberculosis of the dry type. On opening the thoracic cavity both lungs are well retracted from the thoracic wall. There are no adhesions. There is no excess of fluid in either cavity. Over the surface of both lungs there is a dry, fibrinous pleurisy, which is very mild. Heart is not enlarged. The pericardial cavity contains an excess of clear, straw-colored fluid. The pericardial sac is smooth and there are no adhesions. No tubercles can be made out in the pericardial sac.

Heart.—Weighs 200 grams. It is quite small. The epicardial surface is smooth and of a uniform color. There is very little epicardial fat present. The right auricle is not dilated. Its intima is everywhere intact, smooth, and glistening. There are no thrombi present. The tricuspid orifice measures 11 cms. The valves are perfectly normal. The right ventricle is not enlarged. The intima is everywhere smooth. The pulmonary orifice measures 5½ cms. The leaflets are thin, delicate, and appear quite normal. The left auricle is not enlarged. The foramen ovale is closed. Its intima is everywhere intact and no thrombi are present. The mitral orifice measures 8 cms. The leaflets are delicate and quite normal. The left ventricle is not enlarged. The papillary muscles and columnæ carneæ are perhaps smaller than normal.

The endocardium is smooth and intact. The aortic orifice measures 5½ cms. There is no sagging of the valves. They are quite thin, delicate, and normal. The coronary vessels are patent and quite normal. On section the heart muscle is of a reddish-brown color. In one place there is a small patchy increased connective tissue. There does not seem to be any diffuse increase, however.

Lungs.—Right lung is slightly voluminous, especially along its free margin. It is everywhere crepitant. Over the surface of the lower lobe there is a thin layer of friable, fibrinous exudate. It tends to occur in small clumps over the surface of the lung. The upper lobes are quite free. On section the lung presents a uniform grayish color and quite free from pigmentation. There are no areas of broncho-pneumonia to be made out. The hilic lymph glands are very large. On section they are entirely caseated, of a grayish-yellow color with streaks of coal pigmentation running through it. The bronchi are clear. The left lung is almost indentically the same as the right. The pleurisy is slightly more marked on this side and is present over the upper as well as the lower lobes. There are no fibrous adhesions. The lung on section is uniform, and is everywhere crepitant. The hilic lymph glands are tremendously enlarged on this side and extend into the lung substance for a considerable distance. All of them are caseated, a few of them are soft in the center. The bronchi are normal.

Spleen.—Weighs 200 grams; measures 14 by 8 by 4½ cms. There is a thick adherent capsule. The diaphragm is adherent to the spleen. Large caseated tubercles are seen over the surface. On section the spleen is a bright red color, and in it there are numerous large caseated tubercles, measuring 3 to 4 mms. in diameter. The spleen is rather firm. The trabeculæ appear rather prominent. The Malpighian bodies can be made out but are not especially enlarged.

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Stomach.—Is not enlarged. The cardiac and pyloric ends are patent and have normal mucous membranes.

Pancreas.—Is about normal in size. The lobulation is quite distinct. There does not appear to be any increase in interlobular connective tissue. No tubercles are present. It is of about normal consistence.

Liver.—Weighs 1,100 grams; measures 23 by 14 by 7 cms. There are dense adhesions all over the surface of the liver. In these adhesions are numerous, large, caseated tubercles. On section the liver is of a brownish-red color. The lobulation is quite regular. There is apparently some swelling and increase in size of the portal areas. Scattered throughout the liver there are numerous bile-stained, caseated areas measuring 3 to 5 mms. in diameter. In several places these areas have undergone softening and on section a bile-stained, caseous material escapes, leaving a cavity. The gall bladder is normal in size. Bile passages are free. The common and pancreatic ducts open together into the duodenum.

Kidneys.—Are alike; weigh 340 grams; measure 12 by 6½ by 3 cms. The capsule strips readily, leaving a smooth surface. On this surface there are some elevations which have a red periphery, and a white, caseous center shimmers through. On section the cortex is rather pale. The striation is quite marked and regular. In many places there are large caseated tubercles present. The glomeruli are seen as small, grayish, translucent, or reddish dots. The pelvis is clear.

Adrenals.—Are normal and of the same size. On section the architecture is quite normal. The medulla appears pale. Otherwise normal.

Pelvic organs.—Bladder is normal in size and lined by a normal mucous membrane. The prostate is small and appears quite normal on section. The seminal vesicles show no evidence of tuberculosis. Testicles are quite small. They are, however, about normal in consistence. On section there is no increase in connective tissue. The tubules pull out readily. The epididymis is clear. The rectum is normal in appearance.

Lymph glands.—Thoracic and abdominal lymph glands are everywhere markedly enlarged. They are all almost entirely completely caseated. The largest lymph glands are found along the trachea and at the hilum of the lung. Here seems to be the oldest process and some of them have undergone considerable softening.

Aorta.—Appears quite small. It measures 4cms. on section; there is no sclerosis, and its elasticity is well preserved. The œsophagus is normal. Trachea shows no ulceration.

Intestine.—They are so matted together by dense adhesions that satisfactory examination is not possible. The perforation mentioned above occurs in the lower third of the ileum. In the wall of the intestine there are numerous large tubercles which have undergone caseation. In the mucosa no ulcerations are present.

Brain and cord.—Are removed. There is no exudate present. The surfaces are everywhere smooth. No tubercles can be made out.

MICROSCOPICAL NOTES.

Heart.—Some atrophy of muscle fibers and a slight brown atrophy.

Lung.—Emphysema. A small area of consolidation due to round cell infiltration and a beginning organization, possibly a tubercle, but not typical.

Liver.—Old tubercles, many of which are bile stained. Bile-stained edge of a tuberculous cavity showing pretty granulations and marked active congestion

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of the liver, with some atrophy of liver cells. Beautiful tuberculous perihepatitis.

Kidney.—Large caseous tubercle, with proliferation about. Cloudy swelling. Considerable post-mortem digestion. Kidney epithelium not well preserved.

Spleen.—Large and small, caseous tubercles. Engorged vessels. Chronic perisplenitis.

Lymphgland.—Complete caseation, with a rather thick rim of fibrous tissue. Only a few mononuclears and epitheloid cells.

Intestine.—Beneath the serous surface there are large caseated tubercles, exudative in type. Mucosa is intact. From the pelvis the section shows necrosis and some acute inflammation due to an early peritonitis, caused by the intestinal perforation.

Testicle and adrenal.—Normal.

Case N. IV. (Control. Broncho pneumonia; acute enteritis; acute pericarditis.) W. Z.; male; white; 54 years of age. Admitted to Johns Hopkins Hospital April 20, 1914.

No family and personal history obtained.

Present illness: On admission, apathetic, emaciated; rapid respirations; cough. Foul breathing, with stinking, mucopurulent sputum. Hot, dry skin. Enophthotnosis. Arcus senilus. Pyorrhoea, dental caries. Barrel-shaped thorax, signs of consolidation. Fluid at the right base, with bubbling rales at both bases. Diffuse, musical rale. Arterial thickening. Slight displacement of heart and liver. Leucocytosis. Needle inserted into ninth interspace in the scapular line obtained one-half syringe full of pus, which was dirty, greenish, and stinking.

Microscopical: W. B. C. gram positive micrococci, bacilli, and a few grams negative bacilli. Blood count, red blood cells, 4,500,000. W. B. C., 18,500; Hb., 78 per cent. Temperature at this time, 102 to 103½ degrees, and continued so throughout the course of his illness. On April 22 the patient was operated on for lung abscess and drainage tube was inserted. He did not improve, and died at 3.45 a. m., April 28, 1914.

NECROPSY.

(April 28, 1914.)

ANATOMICAL DIAGNOSIS.

Multiple abscesses of right lung; surgical incision; organizing pneumonia; chronic fibrous pleurisy; acute bronchitis and tracheitis; necrotizing bronchopneumonia (left lung) and upper lobe of right; cloudy swelling of viscera; acute enteritis and colitis; acute pericarditis.

Body.—Is that of an emaciated white man, 162 cms. long. The mucous membranes are pale. The teeth are in poor condition. There is some hypostatic congestion of the dependent portions of the body. Rigor mortis is very well marked over the extremities, being rigid. There is a surgical incision in the right posterior axillary line two fingers' breadth below the angle of the scapula. In this incision is a gauze drain, which on removal is quite foul smelling. The subcutaneous fat is scant. There is no excess of fluid in the abdominal cavity. The peritoneal surfaces are everywhere smooth and glistening. The mesenteric lymphglands are not enlarged. There are a few adhesions around the spleen, binding it to the anterior abdominal wall. The serous covering of the intestine has a rather faint, milky white appearance. Both lungs are rather firmly adherent to the parietal pleura by old fibrous adhesions. No excess of fluid is found in either pleural cavity. The right lung is much more firmly bound down than the left. The pericardial cavity contains about 50 c. c. of a slightly turbid, yellowish fluid. The pericardial surfaces, parietal and visceral are injected. A few minute ecchymoses are seen scattered over their surface. It has a faintly granular appearance.

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Heart.—Weighs 280 grams. The epicardial fat is fair in amount. The consistence of the heart muscle is fairly firm. Shape about normal. Right auricle presents a smooth and glistening endocardium. The clots are very firm and tenacious, but on being removed no erosions found. Foramen ovale is closed. The tricuspid ring measures 13¼ cms. The valves are delicate, except for a few thickenings along the insertion of the chordae tendineae. The chordae tendineae are delicate and translucent. The wall of the right ventricle shows only a few indefinite gray patches. The thickenings of the ventricle is 3 mm. The capacity of the ventricle is about normal. The pulmonary ring measures 9 cms. The valve cusps shows very slight thickening and are delicate. The surface of the pulmonary artery is smooth. The left auricle is normal. The mitral ring measures 10½ cms. The valves are delicate, except for the thickenings at the insertion of the chordae tendineae. The chordae tendineae are delicate. The ventricular wall measures 11 cms. The endocardium of the ventricle shows several small indefinite gray flecks on the surface. The aortic ring measures 8 cms. The valves are delicate and competent. The surface of the aorta is smooth, and its elasticity is quite good. The coronary arteries are normal. The myocardium has a rather pale, œdematous appearance. Many minute, reddish dots are seen throughout its substance. Some of these are ill-defined and have a depressed appearance. There are some areas where there are pale, indefinite silvery spots also seen.

Lungs.—Left lung is voluminous. On the surface of the lung are many fibrous tags which are most abundant in the posterior portions of the lower lobe. Three well-defined lobes are present. It is very voluminous and quite elastic, not recovering its shape when exposed to pressure. It has a rather rubbery consistence of palpation. In some places small areas of consolidation are made out. On section the lung is quite moist. The color of the upper lobe is a pink. It is crepitant throughout. The air spaces are quite large. Here and there, however, one encounters a small area of consolidation which has a dark purplish-black, granular periphery, and the center is grayish, opaque, and easily evacuated. The lower lobe is of a deeper pink color and crepitant, except that the areas as above described are much more numerous and prominent. The bronchi are greatly injected and filled with a purulent exudate. The linear striations are prominent. The mucosa appears oedematous. The pulmonary artery at the hilum contains only post-mortem clots, which, however, form beautiful cast of the vessel. The lymphglands at the hilum are large and soft. They contain an abundance of black pigment and on section are rather moist with some injection of the vessels. Right lung: The lobes are matted together. The surface is covered by firm, fibrous adhesions. Over the lower lobe the parietal pleura is still firmly attached to the lung. The upper lobe has a few fibrous tags, but the surface is rather dull and has a slightly granular appearance. The lobes are adherent, but can be separated. Between the upper and middle lobe is found about 5 c. c. of thick purulent fluid. The pleural surface of the middle lobe at this point is eroded, numerous small cavities filled with purulent fluid found, many underlying the pleural surface. The lower lobe is very firm and hard in consistence and one is unable to dent it. The upper lobe is crepitant except for many nodules felt throughout the substance. The middle lobe is consolidated, but has a much more rubbery consistence than the lower lobe. On section the upper lobe is rather moist and crepitant. It is pink in color. Here and there reddish areas which are granular and consolidated are found. The inferior portion of the upper lobe is consolidated and of a grayish-white appearance. It is rather glary and faintly granular. It is noncrepitant. On scraping it with the knife the purulent fluid is carried away. The middle lobe is moist on section containing much purulent secretion. The color of the

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lung is a gray. It has a gelatinous appearance. It is mottled with yellowish gray areas varying in size from 2 to 10 mms. in diameter which are soft and opaque. These areas are usually bordered by a reddish zone. Numerous, shiny, silvery strands which apparently are fibrous tissue traverse this portion of the lung. The lower lobe on section holds its shape perfectly. It is grayish in color mottled with black pigment and also with yellowish, opaque, soft areas. On section it is not granular. It is apparently smooth. The air sacs are made out in some places, but not in others. As a whole this lobe has a rather silvery cast. Numerous strands of whitish tissue are seen traversing it. The pleura over this lobe is about 2 mms. thick and numerous reddish dots are seen in it. In the posterior portion of the lung is a cavity corresponding to the point of the incision, which has a leathery border. It contains gauze drains. The bronchi are similar in appearance to those of the left lung.

Spleen.—Weighs 180 grams; measures 13 by 7 by 3½ cms. Its consistence is rather firm. The surface has several tags attached to it. On section the color is red. The Malpighian bodies are seen with some difficulty, but are made out as grayish, translucent dots which are apparently slightly increased in size. The trabeculæ are increased in number and are quite prominent. The pulp is lighter in color than is usually seen and does not scrape off readily on the knife. Many pale, reddish, translucent dots are seen scattered throughout the substance.

Stomach.—Is filled with pea-soup-like substance. The rugæ are not present. The mucosa is covered with a rather glary mucouslike substance. The vessels are made out in some places quite distinctly. The pylorus is normal. The duodenum is likewise normal. The bile ducts are patent throughout their course and yellowish bile is easily expressed through them. The gall bladder is normal.

Pancreas.—Is rather more firm in consistence, about the usual size, and on section the lobulation is distinct. The islands are made out as grayish, translucent gray dots.

Liver.—Weighs 1,500 grams; measures 24 by 18 by 6 cms. The surface is smooth and glistening. One area in the right lobe is rather indefinitely gray and the capsule is apparently slightly thickened. On section the lobulation is distinct. The central portion of the lobule is definite and appears as a depressed reddish translucent dot. The periphery is a rather broad, translucent gray zone.

Adrenals.—Are of normal size. On section of normal appearance.

Kidneys.—Right one weighs 190 grams; measures 12 by 6 by 3½ cms. Left weighs 160 grams; measures 12 by 5 by 3½ cms. The capsule strips with some difficulty, and does not come off completely. Where it is removed it leaves a slightly granular surface on which the stellate veins are very prominent. Section of the cortex measures 9 mm. in thickness. It is not uniform in thickness, but varies. The cortical striations are distinct, and have a rather œdematous appearance, and in some places there is a slight waviness. The glomeruli are made out with varying prominence as minute, reddish dots. Here and there is an ill-defined grayish dot scattered through the cortex. The pyramidal striations are regular. Gas bubbles are made out in some of the blood vessels. On the surface of the kidney is one small, yellowish, opaque softened area about 1 mm. in diameter.

Rectum.—Has a slightly flushed appearance. The blood vessels are prominent. There are two small dilatations of the hemorrhoidal veins. The bladder is small and contracted. The vessels are prominent. No ecchymoses, however, are made out. Prostate is of the usual size and consistence, and on section appears normal.

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Trachea.—Shows very marked flushing, which is particularly prominent at the bifurcation, where numerous, small ecchymoses are made out. The hilic glands present in this portion are large, rather soft, and deeply pigmented. The thyroid is not found. The surface of the aorta is smooth except for a few small, slightly elevated, grayish and yellowish spots. The elasticity is fair.

Intestines.—The jejunum has a rather definite flushed appearance throughout its course. The ileum is not involved, except for a few localized areas of flushing. The Peyer's patches are slightly hyperplastic. The solitary follicles of the lower portion of the ileum are also hyperplastic. The cæcum has a slight definite flush. The mucosa of the colon also is flushed slightly. There is a very heavy mucoid secretion over its surface and the mucosa seems œdematous.

Brain and cord.—Normal.

MICROSCOPICAL NOTES.

Lungs.—The pleural surface shows a well-developed organizing pleurisy. The alveoli are filled with an exudate which is in some places composed almost entirely of polymorphonuclears. The structure of the lung in these places is practically obliterated. In other areas the alveoli are filled with a uniform exudate, which is apparently compact fibrin, in which are apparently young proliferating fibroblasts. The bronchii show a well-marked purulent exudate which involves the alveolar walls.

Liver.—Shows considerable dilatation of the capillaries. Liver cells are large and granular. In the central portion of the lobule they contain some pigment. The heart muscle shows scattered areas of collected pus cells.

Kidneys.—Normal.

Intestines.—There is a collection of mononuclear cells in the interstitial tissue of the mucosa.

Adrenal.—Has areas which are apparently ill-defined adenomas.

Spleen.—The Malpighian bodies are very large and diffuse. There is apparently an increase in the pulp cells.

Case P. I. (Pellagra.) M. B. B.; female; negro; 16 years of age; single.

Born in Marengo County, Ala.

Lived on farm prior to her admittance to the Mount Vernon Hospital, Mount Vernon, Ala., on November 18, 1913.

Family history: Not obtained.

Pellagrous history: Extensive erythema, involving skin of hands and forearms, face, neck, shoulders, and chest to a line below the lower margin of scapula. Has stomatitis and diarrhea, but her appetite is very good. Breath is very offensive. Gait is unsteady and staggering. Became increasingly nervous while in hospital. Twitching of muscles and convulsions before death. Died December 9, 1913.

Case P. II. (Pellagra.) Male; white; age, 43.

Personal history: Born 1870, Richland, Ga. Has lived within 10 miles of this place all his life. Farmed up to 1904; was a miller from 1904 to 1910. No occupation from 1910 to 1913. In moderate circumstances. General health, good up to 1910. Had mumps, whooping cough, pneumonia, and "fever" prior to this date. No history of indigestion. Denies having had syphilis and gonorrhea. Used tobacco and alcohol (whisky) in excess. Did not drink much during the last four years. Likes corn bread and bacon. Eats very few vege-

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tables, such as turnips, etc. Takes very little milk, eggs, and meats of all kind. Dislikes all sweets, potatoes, and butter. Is hard worker.

Family history: No pellagrous relatives. Mother is insane.

Pellagrous history: First attack in 1910, when living at Richland, Ga. Second attack in 1912. Had moved from a corn mill to a cotton mill. Had four to five bowel movements a day. Present attack began August, 1913. Intense diarrhea. Scaly eruption on hands and elbows. Hands burn, and there is present stomatitis. Admitted to Marine Hospital, Savannah, Ga., November 1, 1913, with uncontrollable diarrhea and sleeplessness.

November 18: Patient's diarrhea and general condition has improved slightly. Had received several doses of atoxyl and tinctura opii.

November 19: Complains of nausea and vomiting. Slept fairly well. Appetite not so good as on admission.

December 13: Patient has gradually lost in strength. Diarrhea persists in spite of opium, bismuth, and other drugs. Vomits at times and has lost his appetite.

December 14: Has a slight convulsion. Very weak. Takes only 1 pint of milk and 2 eggs.

December 19: Patient seems to be weaker. Became unconscious last night. No change in diarrhea. Refuses to eat anything but a little milk and egg. Was reported to be delirious and unconscious last night. Complains of great pains in abdomen, especially when bowels move.

December 22: Patient seems to be a little stronger to-day. Ate a fairly good meal yesterday. No change in diarrhea. Had a delirious spell for a few minutes.

December 23: Seems a little stronger to-day. Eats very little. Intense diarrhea. Given 375 c. c. warm saline solution intravenously at 2 p. m. on account of weak circulation. No improvement.

Dies at 2 a. m., December 27, after all form of treatment had been tried. Had been growing steadily worse for the past two or three weeks; at times exhibited mental depression and excitement.

November 1, 1913: Examination of urine, sp. gr. 1,015, acid; albumin, neg.; sugar, neg.; strong indican reaction. Patient's temperature was normal; became subnormal before death.

NECROPSY.

(Dec. 27, 1913, 10 a. m.)

Body emaciated. Lungs clear; no edema or congestion. A few adhesions between the left lobes and cristal wall. Heart: No enlargement; valves normal. Liver: External surface somewhat mottled; on superior surface of edge were seen whitish lines, apparently scar tissue, running along the course of the small blood vessels. Spleen: Slightly enlarged, moderately fine. Alimentary tract: No notes. Kidney: Microscopically normal, capsules strips off readily. Brain and cord: Increased amount of fluid beneath dura.

Case P. III. (Pellagra.) M. C.; female; negro; about 35 years of age. Inmate of the Mount Vernon Hospital, Mount Vernon, Ala.

Had delusions of persecution. Died of pellagra, without complications, December 15, 1913.

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NECROPSY.

Body emaciated; typical pellagrous skin lesions. Brain soft. No other gross pathological changes observed.

Case P. V. (Pellagra.) T. H.; female; white; 43 years of age. Admitted to State hospital, Milledgeville, Ga., March 3, 1914.

History.—Information obtained from husband and patient. Family: Mother died at 40, following childbirth. Father living; said to be insane. Nothing known of grandparents. One paternal uncle said to be insane. Personal: Patient 43 years old; healthy as child; attended school irregularly; said to be a normal child. Married at 20. Menstruated at 15. Married life congenial. Always healthy, with the exception of the history of pellagra. Four children living; labor unaccompanied by any abnormalities.

Present illness.—Patient states that for about 15 years, every spring or twice a year, her hands would become red, as if sunburned. Occasionally had an attack of diarrhea. Condition would clear off and patient would feel quite well between attacks; during last few years she lost weight progressively. She referred to the skin condition as "erysipelas." Denies ever having any mental trouble previous to the present, nor did her husband notice any. In September last year hands again became red and scaly; at that time had sore mouth and diarrhea.

Physical summary.—Examination made March 6, 1914, three days after admission. Poorly nourished white female, showing considerable anemia; pallor of mucus membrane; thickened, discolored, scaly skin over posterior surfaces of hands, extending up the forearm about 8 cm. and encircling wrist. Tongue presented a sleek appearance. Deep reflexes all equally exaggerated. Slight diarrhea present. Subjective complaints of nervousness; burning of skin. Pupils normal. No disturbance of cutaneous sensibility. Muscular strength much reduced.

Mental summary.—Patient appeared depressed when interviewed, frequently wept, talking in an indistinct whining tone of voice, answered questions quite relevantly, seats herself in a rather dejected, uncomfortable manner, restlessly picking at her dress or fingers. Frequently questions must be repeated. Cleanly in her habits; at times appears apprehensive, especially when alone in her room. Takes very sparingly of food; sleeps three or four hours of the night. Never associates with other patients. Remains in bed the greater part of the time; makes few requests. Has not learned the names of physician and nurses, and makes no inquiries. Begs to be allowed home. Expressed few ideas of persecution, believing that poison had been placed in her food and milk. Claims that God has spoken to her at times and that she has seen her children. Claims that she is very much frightened, says that she is afraid something is going to happen to her and her children. Admits that she is downhearted and blue. Is disoriented for place, does not recognize the character of the institution other than it is some kind of hospital. Does not know the day of the week, but knows the month. Does not recognize the physician, but mistakes the examiner for another physician to whom she had spoken the day before. Her memory for recent is very poor, believes that she has been at the hospital five days when in fact she has been here but three. Knows she came on train, but has a very meager recollection of her trip to the hospital or what transpired soon after her reception. Her memory for remote was much better. Patient was able to name her school teachers and recall events of her earlier life. Her grasp in general was in accord with her opportunities and station in life. Patient's mental calculation was performed slowly. Patient could not continue at a

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simple problem for any length of time, claiming that she became exhausted and she could not think as she wanted to. Her retention of test words and numbers was defective. She had some insight into her condition, thought that there was something wrong with her mind, remarked that she could not collect her thoughts and keep them together and that her memory was poor at times, said that she frequently felt very confused.

Note March 23, 1914.—The patient showed very little change in her mental and physical condition up until two days ago, when she became restless, very confused; at that time did not recognize the examiner or nurse; was entirely out of contact with her surroundings; muttered and mumbled to herself in an unintelligible manner. Coarse jactatory tremors of arms and legs were pronounced. Dorsal surfaces of hands and skin encircling wrists appeared very red and inflamed with scaly desquamation over reddened areas. Tongue very brightly red; gums and mucous membrane also showed reddishness. Bowels constipated. Patient did not understand questions that were asked her. At one time referred to the examiner by some name familiar to herself. Bowel and bladder control lost. Emaciation and anxious expression on the face quite apparent. Pulse, 110. Temperature, 97.8.

Note, March 26, 1914.—Patient continues in stuporous state, during which she could not be made to understand any questions, and was entirely lost to her surrounding. She grew progressively weaker; muscular twitching and jerking became more pronounced. Died at 2 a. m.

SPINAL FLUID EXAMINATION.

Lumbar puncture made March 21, 1914.

Cells	Per c. mm.
Ammonium sulfate (Ross-Jones test)	Negative.
Noguchi butyric acid test	Negative.
Colloidal gold chloride solution	Negative.

Wassermann test, slight inhibition of hemolysis present.

Wasserman of blood serum made Mar. 6, 1914 ..... Negative.

NECROPSY.

(At 9 a. m. March 27, 1914.)

Somewhat emaciated; scaly dermatitis over both hands, posteriorly, and encircling wrists; over both elbows, posteriorly, darkened, roughened, scaly skin symmetrically situated. Similar patches over sacrem. Pupils are equal, 3 mm. Post-mortem discolorations over dependent portions of the body. Rigor mortis present in both extremities. On section, small amount of subcutaneous fat. Abdominal viscera in normal position. Thoracic viscera normal position.

Both lungs negative, excepting slight edema and congestion at the bases. Heart, 275 grams, showed nothing abnormal other than the muscle was pale and flabby and the valve flaps very slightly thickened. Aorta showed slight amount of atheromatous degeneration. Spleen somewhat congested. Weight, 120 grams. Somewhat firmer than normal, slight increase of connective tissue. Liver weighed 120 grams, was pale and anemic, had cloudy appearance, central veins rather prominent, consistency about normal. Right kidney, 155 grams. Nothing abnormal, capsule slightly adherent, entire organ rather pale. Left kidney, 200 grams, presented same appearance and condition; suprarenals, negative. Uterus, fibrous and slightly enlarged. Small intestines, negative with the exception of a few areas of congestion in the mucosa of the ilium. Large intestines, patches 6 to 8 cm. in diameter of congestion in the mucosa; in

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some instances very marked. Above the areas of congestion a granular appearance was noted. These patches were irregularly distributed throughout the colon. The remaining viscera showed nothing abnormal to the eye.

Brain.—Skull of normal thickness; nothing abnormal noted in scalp. Edematous piamater. Apparent increase of cerebrospinal fluid. Adhesion between pia and dura in the neighborhood of longitudinal sinus slightly more marked than normal. Pial vessel slightly congested and pia strips from brain very readily. No areas of softening or gross changes were observed. Basal vessel normal in appearance.

Cord.—No gross abnormalities were observed. In region of the fourth lumbar interspace a perforation of the dura with a slight ecchymosis surrounding perforation was noted. (Patient was punctured at this site.)

Case P. VI. (Pellagra.) B. G.; female; white; 42 years of age. Admitted to State Hospital, Milledgeville, Ga., March 21, 1914.

History.—Born in Columbia, S. C., in 1872. Age, 42. One child living; age, 24. One child dead; cause unknown. Unable to read and write. Father farmer. Husband special officer of the Central Railroad. Father a periodical drinker. Patient's usual health was good until two years ago, since which time it has been declining. However, patient did her housework until about a month ago, at which time she went to bed, remaining there a day or so and then returning to work, which condition continued until two weeks ago. Then the patient developed an acute excitement and was placed in jail, since which time the acute excitement continued. She was in bed apparently from exhaustion. Usual weight, 145 pounds; present weight, 90 pounds. Nothing is known of either of paternal or maternal grandparents, except they lived to be old. Father living, in good health; one maternal cousin said to have become insane; six brothers, in good health; one sister killed accidentally. Mother died at 40, probably insane for two or three years; said to have died from tuberculosis. Statement was made that the mother's condition was very much like patient's present condition. Birth of patient was difficult; instruments were used. General health in infancy good. As a child was obedient and cheerful. Attended school but a very short time. Does not know why patient did not learn at school. Six years ago had vaginal operation performed at Savannah.

Present illness.—Just before the insanity began it was noticed that patient would be blue and downhearted for a day or so and would be irritable and cross. No previous attack. Her memory before insanity very good; since it developed memory has been poor. About a month ago patient spoke of suicide, remarking that she would rather be dead than alive. Just before being placed in jail she tried to hit her husband with her fist. At times she spoke of having considerable money. This was during the excitement. The month previous to insanity she at times said that her food did not smell nor taste right and complained of headache in frontal portions of head at irregular intervals during last six months. During last six weeks slept very poorly. Appetite very poor. Patient had two miscarriages—one several years ago, one about four years ago; cause of this unascertained.

Physical examination.—Many teeth missing. Complexion sallow. Panniculus scant. Muscles flabby. Mucus membrances very red and inflamed. On posterior surfaces of hands, extending about 8 or 10 cm. up the wrist, is the characteristic darkened, reddening of pellagrous eruption with scaling. This scaling is more marked on the dorsal surfaces of the fingers. Over the second and third joints the skin is very much roughened and thickened. This condition is bilateral and symmetrical. The darkened discoloration is also over the

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posterior surfaces of elbows and along the course of the ulna nerve. Anterior surface of ankles show slight thickening and roughening. Some roughening and scaling on toes. Eyes sunken. Conjunctivae anaemic. Pupils dilated, react to light, reaction rather sluggish. Smell, sight, taste, and hearing could not be satisfactorily examined, neither could sensibility. Deep reflexes active. No clonus. Tremors not apparent; speech showed no characteristic defect. Bowels constipated, according to history. Tongue appears red and deeply fissured. Abdomen rigid, boardlike.

Mental examination.—Patient was brought to ward on stretcher, apparently very feeble. Lies in bed, inclined to follow in a vague way any movement that goes on about her. Talks to herself, and throws her hands, muttering at times in a very indistinct voice something about wanting water. Occasionally she will reiterate the same word in a monotonous tone until the same will become quite indistinct. She obeyed a few simple commands, such as opening her mouth, shutting her eyes for tremors, etc. Upon several occasions she referred to the physicians and nurses as "Pa." When asked where she was, she looked at the physician in a confused manner, opened her mouth and popped her teeth together several times. When asked what day it was, she said it was the 4th of July. "Where is your home?" "Pa." Many questions that were asked were not replied to. Patient continues to look about the room muttering some unintelligible words. It was evident that patient is in a delirous condition. Occasionally noticed to be very restless, drawing up her legs and arms. At such times tremors are noticed. She will move about in bed from side to side. Will permit flies to light on her face and make no effort to remove them.

March 24, 1914.—Within the last 24 hours the dorsal surfaces of hands and wrists became a pinkish color. This condition is bilateral and symmetrical.

Staff meeting.—Diagnosis, pellagrous insanity, infective-exhaustive type.

March 30, 1914.—Patient confined to bed. Sleeps very irregularly. Rolls about from side to side picking at cover. Entirely oblivious to surroundings. Never speaks any intelligible words. Bowels very loose. Urine must be obtained from catheter. Face is frequently contorted. Lips are chapped. Tongue much reddened. Saliva dribbles from corners of mouth on pillow. Patient pays no heed to questions nor does she assist in any way with her care.

April 17, 1914.—Patient has continued in delirious state formerly described. Picks bedclothes. Coarse jerky termors of the upper extremities are present. At no time has any intelligible reply been obtained to questions. She has developed a very marked odor; the red appearance of the skin has subsided but left a scaly, darkened, roughened skin over the areas formerly involved. Bowel and urine discharges pass unheeded. Takes liquid nourishment when fed. Very evidently in a marked delirious state; that is, the appearance of a severe typhoidal state.

Died April 24, 1914, at 6.10 a. m.

SPINAL FLUID EXAMINATION.

April 17, 1914.

Cells	0 per cm.
Am. sulphate	Very slight ring at contact.
Noguchi butyric acid	Negative.
Colloidal gold chloride solution	Negative.
Wassermann test	Negative.

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NECROPSY.

(April 24, 1914, 7.45 a. m.)

Extremely emaciated, showing slight bed sore formation over scarum. Pupils equal 2.5 mm. diameter. Body still warm.

Roughened scaly skin over back of hands extending 6 cm. up the forearm and encircling the wrists. Small areas over both elbows posteriorly roughened and scaly, somewhat discolored. Small skeleton. On sections muscles very anaemic. Abdominal and thoracic viscera normal with the exception of liver, which extends about 6 cm. below the border of the ribs. Both lungs are free of adhesions, normal in appearance. Right lung shows some edema and congestion in its lower lobe posteriorly.

Heart negative with exception of pale muscles and apparently slight increase of fibrous tissue myocardium. Aorta shows small patches of atheroma.

Spleen considerably enlarged, slight increase of consistency. Both kidneys show nothing other than slight cloudy appearance on section. Capsule stripped quite readily.

Liver appears enlarged and pale in color. Consistency about normal. Suprarenals normal in appearance. Stomach somewhat dilated, contains about 10 ounces of fluid. Mucosa hyperaemic. Mucosa of colon shows areas of petechial hemorrhages.

Uterus enlarged, due to several small fibroids. Tubes and ovaries normal in appearance, latter somewhat sclerosed. Pancreas normal in its appearance, somewhat enlarged.

Brain.—Dura, negative. Vessels of pia are injected. No gross lesions of the brain discernible. Spinal cord appears rather small and fairly firm. Vessels of the pia are injected.

Weight of organs.—Brain, 960 grams; cerebellum, 139; cord, 29.5; left lung, 170; right lung, 270; heart, 180; liver, 1,020; spleen, 190; pancreas, 170; left kidney, 120; right kidney, 120.

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ANALYTICAL RESULTS.

TABLE 1.—*Human, cerebrum—Comparison of two normal cases with five cases of pellagra—Relative proportions of the constituents in per cent of fresh tissue.*

Laboratory and case Nos.	Weight of fresh cerebrum in grams.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids.
				Lipoids.					Proteins.	Extractives—Total organic and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
NORMAL.										
33, N. III	1,129	77.1	22.9	6.45	1.81	2.19	2.41	12.46	8.46	1.55
37, N. IV	1,066	76.6	23.4	6.59	1.93	2.24	.....	12.73	8.88	1.82
Average	.....	76.9	23.1	6.52	1.87	2.21	2.41	12.59	8.67	1.68
PELLAGRA.										
1 and 4,[1] P. I	.....	80.40 79.58	19.60 20.42	5.18	1.06	1.35	1.86	10.48	7.70	1.83
6 and 8,[1] P. II	.....	77.37 77.70	22.63 22.30	5.83	1.17	1.43	1.95	11.98	8.62	1.81
11, P. III	.....	76.60	23.40	6.01	1.25	1.39	1.58	13.08	8.60	1.72
19, P. V	1,420	77.48	22.52	5.92	1.57	1.82	1.89	11.54	8.86	2.12
46, P. VI	830	77.05	22.95	5.68	1.03	1.93	1.94	11.51	9.10	2.34
Average	.....	77.73	22.27	5.72	1.21	1.58	1.84	11.72	8.57	1.96
Percentage variation from normal:										
Minimum	.....	±0	± 0	− 9	−15	−12	−14	+ 2	−11	+ 2
Mean	.....	+1	− 4	−12	−35	−28	−24	− 7	− 1	+17
Maximum	.....	+4	−13	−20	−44	−37	−34	−17	+ 5	+39

[1] Average duplicate analyses.

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TABLE 2.—*Human, cerebrum—Comparison of two normal cases with five cases of pellagra—Relative proportions of the constituents in per cent of solids.*

Laboratory and case Nos.	Weight of fresh cerebrum in grams.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Chrystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
NORMAL.										
33, N. III	1,129	77.1	22.9	28.54	7.25	9.73	10.73	54.39	37.63	7.98
37. N. IV	1,066	76.6	23.4	28.13	6.04	9.58	9.34	54.34	37.90	7.76
Average		76.9	23.1	28.33	6.64	9.65	10.03	54.37	37.76	7.87
PELLAGRA.										
1 and 4,[1] P. I		80.40	19.60	26.19	5.31	6.73	11.94	52.39	36.75	10.86
		79.58	20.42							
6 and 8,[1] P. II		77.37	22.63	25.93	5.40	6.38	10.04	53.61	36.49	9.90
		77.70	22.30							
11. P. III		76.60	23.40	25.70	5.34	5.96	6.56	55.87	35.46	8.67
19. P. V	1,420	77.48	22.52	26.29	6.99	8.10	8.42	51.20	37.67	11.13
46. P. VI	830	77.05	22.95	24.79	4.51	8.44	8.45	50.07	39.70	10.23
Average		77.73	22.27	25.78	5.51	7.12	9.06	52.63	37.21	10.16
Percentage variation from normal:										
Minimum		±0	± 0	− 9	+ 5	−12	+19	+2	+4	+25
Mean		+1	− 4	− 9	−17	−26	− 9	−3	−1	+29
Maximum		+4	−13	−12	−30	−38	−34	−7	−6	+41

[1] Average duplicate analyses.

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TABLE 3.—*Human, cerebrum—Comparison of two normal cases with five cases of pellagra—Relative proportions of lipoids in per cent of total lipoids.*

Labratory and case Nos.	Content of water, in per cent.	Total lipoids, in per cent of fresh tissue.	Total lipoids, in per cent of solids.	Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.
NORMAL.							
33, N. III	77.1	12.46	54.39	52.47	13.32	17.89	19.72
37, N. IV	76.6	12.73	54.34	51.76	11.11	17.63	17.19
Average	76.9	12.59	54.37	52.11	12.21	17.76	18.45
PELLAGRA.							
1 and 4,[1] P. I	80.00	10.48	52.39	50.00	10.14	12.84	22.74
6 and 8,[1] P. II	77.53	11.98	53.61	48.36	10.07	11.90	18.73
11, P. III	76.60	13.08	55.87	45.96	9.56	10.67	11.74
19, P. V	77.48	11.54	51.20	51.37	13.66	15.82	16.44
46, P. VI	77.05	11.51	50.07	49.51	9.01	16.86	16.88
Average	77.73	11.72	52.63	49.04	10.49	13.62	17.30
Percentage variation from normal:							
Minimum	± 0	+ 2	+ 2	− 1	+11	− 5	+23
Mean	+ 1	− 7	− 3	− 6	−14	−23	− 6
Maximum	+ 4	− 7	− 7	− 7	−26	−39	−36

[1] Average duplicate analyses.

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TABLE 4.—*Human, cerebrum—Comparison of two normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen, in per cent of fresh tissue.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
33, N. III	0.086	0.044	0.010	0.006	0.145	0.038	0.234	0.039	0.311	1.335	0.240	0.158	1.733
37, N. IV	.084	.045	.013	.002	.144	.037	.255	.082	.374	1.336	.177	.167	1.680
Average	.085	.045	.011	.004	.145	.038	.245	.061	.342	1.336	.208	.162	1.706
PELLAGRA.													
1 and 4,[1] P. I	.081	.027	.009	.002	.122	.039	.203	.036	.278				
6 and 8,[1] P. II	.080	.028	.006	.005	.120	.043	.226	.038	.307				
11, P. III	.085	.028	.008	.003	.124	.040	.233	.027	.300				
19, P. V	.084	.036	.013	.003	.136	.042	.230	.043	.315	1.310	.180	.200	1.690
46, P. VI	.095	.039	.009	.009	.152	.039	.221	.059	.319	1.407	.147	.216	1.773
Average	.085	.031	.009	.004	.131	.040	.222	.042	.304	1.358	.163	.208	1.731
Percentage variation from normal:													
Minimum	− 5	−13	+18	− 75	+ 5	± 0	− 4	± 0	− 8				
Mean	± 0	−31	−18	± 0	−10	+ 5	− 9	−30	−11	+2	−22	+28	+0
Maximum	+12	−40	−45	+125	−17	+10	−17	−55	−19				

[1] Average duplicate analyses.

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TABLE 5.—*Human, cerebrum—Comparison of two normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of solids.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
33, N. III	0.384	0.194	0.063	0.006	0.647	0.150	1.039	0.251	1.44	5.930	1.068	0.699	7.697
37, N. IV	.360	.191	.063	.003	.617	.159	1.091	.200	1.45	5.723	.754	.703	7.180
Average	.372	.192	.063	.005	.632	.154	1.065	.225	1.45	5.826	.911	.701	7.440
PELLAGRA.													
1 and 4,[1] P. I	.411	.135	.046	.009	.601	.195	1.015	.181	1.39	.....	.....	.....	.....
6 and 8,[1] P. II	.357	.127	.031	.022	.536	.192	1.006	.169	1.36	.....	.....	.....	.....
11, P. III	.362	.119	.048	.003	.532	.168	.997	.117	1.28	.....	.....	.....	.....
19, P. V	.371	.162	.055	.016	.604	.185	1.021	.194	1.40	5.808	.809	.889	7.506
46, P. VI	.416	.169	.039	.038	.662	.172	.962	.256	1.39	6.135	.656	.942	7.730
Average	.383	.142	.044	.018	.587	.182	1.000	.184	1.36	5.971	.732	.915	7.620
Percentage variation from normal:													
Minimum	− 3	−14	−23	+ 80	+ 4	+10	− 4	+15	− 3	.....	.....	.....	.....
Mean	+ 3	−26	−30	+260	− 7	+18	− 6	−18	− 6	+ 2	−20	+30	+2
Maximum	+11	−39	−57	+660	−16	+26	−10	−47	−11	.....	.....	.....	.....

[1] Average duplicate analyses.

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TABLE 6.—*Human, cerebrum—Comparison of two normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of total sulphur, total phosphorus, and total nitrogen.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
33, N. III	59.30	30.04	8.68	1.98	0.647	12.11	74.96	12.93	1.44	80.00	11.80	8.02	7.697
37, N. IV	58.23	31.01	9.39	1.40	.617	11.00	75.16	13.84	1.45	79.56	10.53	9.91	7.180
Average	58.74	30.50	9.00	1.69	.632	11.56	75.06	13.38	1.45	79.78	11.16	8.96	7.44
PELLAGRA.													
1 and 4,[1] P. I	66.50	22.39	7.56	1.55	.601	14.08	72.98	12.99	1.39				
6 and 8,[1] P. II	66.66	23.68	6.94	2.72	.536	14.03	73.60	12.37	1.37				
11, P. III	67.98	22.40	6.90	2.72	.532	13.10	77.75	9.15	1.28				
19, P. V	61.46	26.80	9.06	2.68	.604	13.20	72.80	14.00	1.40	77.40	10.78	11.82	7.506
46, P. VI	62.83	25.44	5.75	5.98	.662	12.30	69.30	18.40	1.39	79.34	8.48	12.18	7.730
Average	65.48	24.14	7.24	3.13	.587	13.33	73.28	13.40	1.36	78.37	9.63	12.00	7.620
Percentage variation from normal:													
Minimum	+ 5	−12	± 0	− 13	+ 5	+ 6	+ 3	−31	− 3				
Mean	+11	−21	−20	+ 85	− 7	+15	− 2	± 0	− 6	− 2	−13	+33	+2
Maximum	+16	−27	−36	+239	−16	+21	− 7	+37	−11				

[1] Average duplicate analyses.

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TABLE 7.—*Human, cerebellum—Comparison of two normal cases with five cases of pellagra—Relative proportions of the constituents in per cent of fresh tissue.*

Laboratory and case Nos.	Weight of fresh cerebellum in grams.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
NORMAL.										
24, N. III	149	78.60	21.40	5.48	2.01	1.77	1.55	10.61	9.27	1.52
35, N. IV	171	77.66	22.34	5.44	1.20	2.17	1.25	11.68	9.09	1.57
Average		78.13	21.87	5.46	1.60	1.97	1.40	11.15	9.18	1.54
PELLAGRA.										
5, P. I		80.16	19.84	4.59	.42	1.40	1.48	8.80	8.69	2.35
9 and 10,[1] P. II		79.20	20.80	5.03	1.38	1.39	1.78	9.60	9.03	1.78
		79.98	20.02							
13 and 14,[1] P. III		79.57	20.43	4.92	.84	1.53	1.56	9.33	8.06	1.48
		81.60	18.40							
20, P. V	292	76.03	23.97	6.02	.91	1.84	1.97	11.23	10.26	2.48
36, P. VI	130	79.55	28.45	4.82	.....	2.10	1.13	9.34	9.34	1.87
Average		79.29	20.81	5.07	.88	1.65	1.56	9.66	9.16	2.06
Percentage variation from normal:										
Minimum		−2	+ 9	+10	−14	+ 6	−19	± 0	− 6	− 4
Mean		+1	− 5	− 7	−45	−16	+13	−13	± 0	+34
Maximum		+3	−11	−11	−74	−28	+40	−21	+11	+61

[1] Average duplicate analyses.

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TABLE 8.—*Human, cerebellum—Comparison of two normal cases with five cases of pellagra—Relative proportion of the constituents in per cent of solids.*

Laboratory and case Nos.	Weights of fresh cerebellum in grams.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Crystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
NORMAL.										
34, N. III	149	78.60	21.40	25.64	9.41	8.27	7.23	49.55	40.04	10.41
35, N. IV	171	77.66	22.34	24.33	5.34	9.70	5.60	52.29	40.67	7.04
Average		78.13	21.87	24.98	7.37	8.98	6.41	50.92	40.35	8.72
PELLAGRA.										
5, P. I		80.16	19.84	23.25	2.12	7.47	7.47	44.94	40.50	14.56
9 and 10,[1] P. II		79.20	20.80	24.66	6.66	6.81	8.70	46.96	42.12	10.92
		79.98	20.02							
13 and 14,[1] P. III		79.57	20.43	25.42	4.35	7.82	7.64	47.55	42.55	9.89
		81.60	18.40							
20, P. V	292	76.03	23.97	25.11	3.79	7.67	8.23	46.79	40.39	12.82
36, P. VI	130	79.55	20.45	23.60	(6.21)	10.30	5.52	45.63	42.83	11.54
Average		79.18	20.82	24.41	4.23	8.01	7.51	46.39	41.67	11.94
Percentage variation from normal:										
Minimum		−2	+ 9	+1	− 9	+14	−13	− 6	±0	+ 2
Mean		+1	− 5	−2	−42	−10	+17	− 9	+3	+36
Maximum		+3	−11	−7	−71	−24	+35	−11	+6	+67

[1] Average duplicate analyses.

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TABLE 9.—*Human, cerebellum—Comparison of two normal cases with 5 cases of pellagra—Relative proportions of lipoids in per cent of total lipoids.*

Laboratory and case Nos.	Content of water in per cent.	Total lipoids in per cent of fresh tissue.	Total lipoids in per cent of solids.	Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.
NORMAL.							
34, N. III	78.60	10.61	49.55	51.75	19.00	16.70	14.60
38, N. IV	77.66	11.68	52.29	46.52	10.21	18.56	10.71
Average	78.13	11.15	50.92	49.13	14.60	17.63	12.65
PELLAGRA.							
5, P. I	80.16	8.80	44.94	51.74	4.72	15.75	16.68
9 and 10,[1] P. II	79.59	9.60	46.96	51.42	14.18	14.50	18.52
13 and 14,[1] P. III	80.60	9.33	47.55	53.44	9.15	16.44	16.06
20, P. V	76.03	11.23	46.79	53.67	8.08	16.44	17.60
36, P. VI	79.55	9.34	45.63	51.71	.....	22.60	12.10
Average	79.29	9.66	46.39	52.40	9.03	17.14	16.18
Percentage variation from normal:							
Minimum	−2	± 0	− 6	+5	− 3	+28	− 4
Mean	+1	−13	− 9	+6	−38	− 3	+28
Maximum	+3	−21	−11	+9	−67	−17	+46

[1] Average duplicate analyses.

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TABLE 10.—*Human, cerebellum—Comparison of two normal cases with 5 cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of fresh tissue.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
34, N. III	0.076	0.035	0.009	0.004	0.124	0.066	0.213	0.035	0.314	1.454	0.202	0.143	1.799
38, N. IV	.090	.043	.007	.008	.148	.060	.211	.046	.317	1.394	.181	.161	1.736
Average	.083	.039	.008	.006	.136	.063	.212	.040	.315	1.424	.191	.152	1.767
PELLAGRA.													
5, P. I	.064	.028	.013	.004	.109	.081	.178	.052	.311	.....	.....	.....	.....
9 and 10 [1], P. II	.073	.027	.006	.008	.115	.065	.195	.043	.323	.....	.....	.....	.....
13 and 14 [1], P. III	.068	.030	.010	.004	.112	.072	.190	.031	.294	.....	.....	.....	.....
20, P. V	.091	.037	.013	.006	.147	.075	.234	.057	.366	1.783	.172	.315	2.270
36, P. VI	.062	.042	.010	.005	.139	.065	.187	.042	.294	1.405	.228	.158	1.791
Average	.075	.033	.010	.005	.124	.075	.197	.045	.318	1.594	.200	.236	2.030
Percentage variation from normal:													
Minimum	+ 9	+ 7	−37	+33	+ 2	+ 3	+10	−22	− 1	.....	.....	.....	.....
Mean	− 9	−15	+25	−16	− 8	+19	− 7	+12	± 0	+12	+4	+55	+14
Maximum	−23	−30	+62	−50	−17	+35	−16	+42	+16	.....	.....	.....	.....

[1] Average duplicate analyses.

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TABLE 11.—*Human, cerebellum—Comparison of two normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of solids.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
34, N. III	0.354	0.165	0.039	0.02	0.578	0.307	0.994	0.165	1.466	6.794	.0944	0.669	8.407
38, N. IV	.402	.194	.029	.037	.662	.270	.944	.206	1.420	6.236	.809	.719	7.764
Average	.378	.179	.034	.028	.620	.280	.969	.187	1.440	6.515	.876	.694	8.085
PELLAGRA.													
5, P. I	.324	.142	.064	.021	.550	.408	.898	.264	1.570				
9 and 10,[1] P. II	.361	.136	.024	.043	.564	.414	.956	.217	1.588				
13 and 14,[1] P. III	.353	.156	.046	.019	.575	.371	.986	.156	1.514				
20, P. V	.379	.153	.054	.026	.612	.312	.974	.236	1.522	7.439	.716	1.312	9.467
36, P. VI	.402	.206	.044	.028	.680	.315	.916	.210	1.441	6.871	1.115	.772	8.766
Average	.364	.158	.046	.028	.596	.364	.946	.240	1.550	7.155	.915	1.044	9.116
Percentage variation from normal:													
Minimum	+ 6	+15	−30	−32	+ 6	+11	+1	−16	±0				
Mean	− 3	−11	+35	± 0	−4	+30	−2	+28	+6	+9	+4	+50	+12
Maximum	−14	−24	+88	+53	−11	+47	−7	+41	+9				

[1] Average duplicate analyses.

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TABLE 12.—*Human, cerebellum—Comparison of two normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of total sulphur, total phosphorus, and total nitrogen.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
34, N. III	61.10	28.62	6.91	3.37	0.578	20.91	67.84	11.25	1.46	80.83	11.21	7.96	8.407
38, N. IV	60.64	29.22	4.48	5.66	.662	19.00	66.50	14.50	1.42	80.32	10.42	9.26	7.764
Average	60.87	28.92	5.69	4.51	.620	19.95	67.17	12.87	1.44	80.58	10.81	8.61	8.085
PELLAGRA.													
5, P. I	58.82	25.73	11.62	3.83	.550	26.01	57.29	16.70	1.57	.....	.....	.....	.....
9 and 10,[1] P. II	64.10	24.16	6.07	5.67	.564	26.34	60.36	13.30	1.58	.....	.....	.....	.....
13 and 14,[1] P. III	61.26	27.11	9.20	2.43	.575	24.54	65.14	10.32	1.51	.....	.....	.....	.....
20, P. V	61.90	25.06	8.68	4.36	.612	20.50	63.90	15.60	1.53	78.59	7.57	13.84	9.467
36, P. VI	59.06	30.30	6.55	4.09	.680	21.92	63.65	14.43	1.44	78.40	12.80	8.80	8.766
Average	61.05	26.45	8.43	4.07	.596	23.86	62.07	14.09	1.52	78.49	10.18	11.32	9.116
Percentage variation from normal:													
Minimum	−3	+ 4	+ 7	+25	+ 9	+ 3	− 3	−20	± 0	.....	.....	.....	.....
Mean	±0	− 9	+ 48	−10	− 4	+20	− 8	+ 9	+ 6	−2	−5	+31	+12
Maximum	+5	−16	+104	−46	−11	+32	−15	+29	+10	.....	.....	.....	.....

[1] Average duplicate analyses.

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TABLE 13.—*Human, spinal cord—Comparison of four normal cases with five cases of pellagra—Relative proportions of constituents in per cent of fresh tissue.*

Laboratory and case Nos.	Weights of fresh spinal cord in grams.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Chrystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
NORMAL.										
16, N. I	27.61	70.34	29.66	8.14	3.43	3.74	3.45	19.35	8.62	1.68
25, N. II	29.92	71.46	28.55	8.504	3.53	3.21	3.66	18.22	8.73	1.66
27, N. III	31.44	71.16	28.84	9.17	.....	3.81	2.92	19.08	8.13	1.63
29, N. IV	28.81	73.43	26.57	8.27	3.14	3.21	3.34	17.07	7.86	1.65
Average	.....	71.60	28.40	8.52	3.36	3.49	3.34	18.42	8.33	1.65
PELLAGRA.										
2, P. I	30.00	77.93	22.07	6.83	2.40	2.11	3.45	12.82	7.33	1.88
3, P. II	24.41	71.92	28.08	8.97	2.50	3.05	4.69	18.02	8.10	1.96
15, P. III	30.00	72.39	27.61	8.09	1.34	2.34	3.33	17.50	8.62	1.50
21, P. V	32.00	76.33	23.67	7.74	2.51	2.76	3.25	15.22	7.17	1.37
42, P. VI	27.61	82.28	17.72	5.31	.72	1.72	2.33	10.37	6.40	.94
Average	.....	76.17	23.83	7.39	1.89	2.39	3.41	14.78	7.52	1.53
Percentage variation from normal:										
Minimum	.....	+ 0	± 1	+ 5	−25	−12	−30	− 2	+ 3	+19
Mean	.....	+ 6	−16	−13	−43	− 3	+ 2	−19	− 9	− 7
Maximum	.....	+15	−37	−37	−77	−50	+40	−43	−23	−42

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TABLE 14.—*Human, spinal cord—Comparison of four normal cases with five cases of pellagra—Relative proportions of the constituents in per cent of solids.*

Laboratory and case Nos.	Weights of fresh spinal cord in grams.	Content of water in per cent.	Content of solids in per cent.	Colloids.						Chrystalloids.
				Lipoids.					Proteins.	Extractives—Total organic extractives and inorganic constituents.
				Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.	Total lipoids.		
NORMAL.										
16, N. I	27.61	70.34	29.66	27.45	11.57	12.60	11.64	65.30	29.00	5.70
25, N. II	29.92	71.46	28.55	29.80	12.38	11.27	12.84	63.83	30.56	5.61
27, N. III	31.44	71.16	28.84	31.80	.....	13.40	10.12	66.06	28.17	5.77
29, N. IV	28.81	73.43	26.57	31.13	11.80	12.11	12.58	64.16	30.60	5.24
Average	.....	71.60	28.40	30.05	11.91	12.34	11.79	64.80	29.60	5.58
PELLAGRA.										
2, P. I	30.00	77.93	22.07	30.96	10.87	9.55	15.67	58.26	33.20	8.54
3, P. II	24.41	71.92	28.08	32.09	8.91	11.14	16.71	64.14	28.84	7.02
15, P. III	30.00	72.39	27.61	29.32	4.87	8.48	12.06	63.33	31.22	5.45
21, P. V	32.00	76.33	23.67	32.68	8.43	11.45	13.73	64.31	29.87	5.82
42, P. VI	27.61	82.28	17.72	30.00	4.10	9.68	13.16	58.53	36.17	5.30
Average	.....	76.17	23.83	31.01	7.43	10.06	14.27	61.71	31.86	6.42
Percentage variation from normal:										
Minimum	.....	± 0	+ 1	− 2	− 9	− 9	+ 3	± 0	− 2	− 4
Mean	.....	+ 6	−16	+ 3	−38	−10	+21	− 4	+ 7	+15
Maximum	.....	+15	−37	+ 8	−66	−31	+41	−10	+22	+53

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TABLE 15.—*Human, spinal cord—Comparison of four normal cases with five cases of pellagra—Relative proportions of lipoids in per cent of total lipoids.*

Laboratory and case Nos.	Content of water in per cent.	Total lipoids in per cent of fresh tissue.	Total lipoids in per cent of solids.	Phosphatides.	Cerebrosides.	Sulphatides.	Cholesterol.
NORMAL.							
16, N. I	70.34	19.35	65.28	42.07	17.72	19.31	17.83
25, N. II	71.46	18.22	63.83	46.71	19.38	17.65	21.69
27, N. III	71.16	19.08	66.06	48.14	.....	20.29	15.32
29, N. IV	73.43	17.07	64.14	48.52	18.40	18.88	19.61
Average	71.60	18.42	64.80	46.36	18.50	19.03	18.61
PELLAGRA.							
2, P. I	77.93	12.82	58.26	51.42	18.66	16.40	26.90
3, P. II	71.92	19.42	64.14	50.03	13.89	17.36	26.05
15, P. III	72.39	17.50	63.33	46.30	17.69	13.39	19.07
21, P. V	76.33	15.22	64.31	50.32	13.11	17.80	21.35
42, P. VI	82.28	10.37	58.53	51.25	7.00	16.54	22.48
Average	76.17	14.78	61.71	49.96	14.00	16.30	23.17
Percentage variation from normal:							
Minimum	± 0	− 2	± 0	± 0	± 0	− 6	+ 2
Mean	+ 6	−19	− 4	+ 8	−24	−14	+24
Maximum	+15	−43	−10	+11	−62	−29	+44

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TABLE 16.—*Human, spinal cord—Comparison of four normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of fresh tissue.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
16, N. I	0.061	0.074	0.015	0.002	0.172	0.043	0.316	0.026	0.385				
25, N. II	.063	.064	.016	.004	.147	.040	.330	.026	.396	1.466	0.392	0.087	1.945
27, N. III	.062	.076	.013	.005	.176	.043	.356	(.018)	.417	1.451	.314		
29, N. IV	.059	.064	.008	.007	.138	.044	.321	.024	.389		.274		
Average	.071	.070	.013	.004	.158	.043	.330	.024	.397	1.457	.326	.087	1.945
PELLAGRA.													
2, P. I	.068	.042	.009	.003	.122	.029	.265	.026	.321				
3, P. II	.085	.061	.016	.001	.163	.034	.348	.031	.413				
15, P. III		.047	.009		.119	.050	.314	.029	.393				
21, P. V	.055	.077	.013	.001	.146		.300	.024	.339	1.271	.262	.151	1.684
42, P. VI	.061	.034	.008	.006	.109	.026	.206	.023	.255	.980	.167	.093	1.240
Average	.067	.052	.011	.003	.132	.034	.286	.026	.344	1.125	.214	.122	1.462
Percentage variation from normal:													
Minimum	+19	+10	+22	+50	− 5	+19	+ 5	−29	+ 4				
Mean	− 5	−26	−15	−25	−16	−19	−14	+ 8	−13	−23	−34	+40	−25
Maximum	−23	−51	−39	−75	−30	−38	−37	+29	−31				

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TABLE 17.—*Human, spinal cord—Comparison of four normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of solids.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
16, N. I	0.273	0.249	0.050	0.008	0.580	0.144	1.066	0.090	1.30	.....	.....	.....	.....
25, N. II	.218	.226	.054	.016	.514	.140	1.156	.092	1.39	5.137	1.376	0.308	6.819
27, N. III	.284	.264	.044	.017	.609	.149	1.240	(0.063)	1.45	5.084	1.090	.....	.....
29, N. IV	.221	.240	.031	.027	.519	.167	1.202	.094	1.46	.....	1.032	.....	.....
Averages	.249	.245	.045	.017	.556	.150	1.166	.092	1.40	5.110	1.166	.306	6.819
PELLAGRA.													
2, P. I	.307	.191	.039	.015	.552	.133	1.200	.112	1.44	.....	.....	.....	.....
3, P. II	.302	.218	.055	.006	.581	.120	1.240	.110	1.47	.....	.....	.....	.....
15, P. III	.....	.169	.034	.....	.....	.181	1.144	.105	1.43	.....	.....	.....	.....
21, P. V	.325	.230	.057	.004	.616	.....	1.270	.102	1.46	5.368	1.106	.638	7.112
42, P. VI	.342	.193	.078	.003	.616	.147	1.163	.130	1.44	5.531	.943	.522	6.996
Averages	.319	.200	.052	.007	.592	.145	1.203	.111	1.45	5.449	1.024	.580	7.054
Percentage variation from normal:													
Minimum	+21	− 4	−24	−11	−22	−20	−1	+ 9	+2	.....	.....	.....	.....
Mean	+28	−18	+15	−59	+ 6	− 3	+3	+20	+3	+6	−12	+90	+3
Maximum	+36	−31	+73	−82	+10	+20	+9	+40	+5	.....	.....	.....	.....

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TABLE 18.—*Human, spinal cord—Comparison of four normal cases with five cases of pellagra—Distribution of sulphur, phosphorus, and nitrogen in per cent of total sulphur, total phosphorus, and total nitrogen.*

Laboratory and case Nos.	Sulphur.					Phosphorus.				Nitrogen.			
	Protein.	Lipoid.	Neutral.	Inorganic.	Total.	Protein.	Lipoid.	Extractive.	Total.	Protein.	Lipoid.	Extractive.	Total.
NORMAL.													
16, N. I	47.20	42.87	6.73	3.20	0.580	11.09	82.06	6.85	1.30	.....	.....	.....	.....
25, N. II	42.38	43.82	10.50	3.30	.514	10.10	83.20	6.70	1.39	.....	20.17	4.49	6.81
27, N. III	46.60	43.30	7.30	2.80	.609	10.32	85.33	4.35	1.45	.....	.....	.....	.....
29, N. IV	42.63	46.65	7.42	3.30	.519	11.39	82.45	6.17	1.43	.....	.....	.....	.....
Average	44.70	44.16	7.99	3.15	.555	10.72	83.26	6.02	1.39	75.34	20.17	4.49	6.81
PELLAGRA.													
2, P. I	55.63	34.53	7.06	2.78	.553	9.17	82.88	7.95	1.45	.....	.....	.....	.....
3, P. II	51.90	37.43	7.52	3.15	.581	8.20	84.30	7.50	1.47	.....	.....	.....	.....
15, P. III	52.70	39.40	7.90	.....	(0.430)	12.70	79.90	7.40	1.43	.....	.....	.....	.....
21, P. V	52.48	37.67	7.08	2.77	.616	6.33	86.74	6.93	1.46	75.50	15.55	8.95	7.11
42, P. VI	55.50	31.40	8.60	4.50	.616	10.24	80.92	8.84	1.44	79.06	13.48	7.46	6.99
Average	53.64	36.08	7.63	3.30	.591	9.35	82.95	7.72	1.45	77.28	14.52	8.20	7.05
Percentage variation from normal:													
Minimum	+16	−11	+ 8	−12	−22	+17	−4	+15	+3	.....	.....	.....	.....
Mean	+20	−18	− 4	+ 4	+ 6	−13	±0	+28	+3	+3	−28	+82	+3
Maximum	+25	−29	−11	+42	+11	−40	+6	+46	+6	.....	.....	.....	.....

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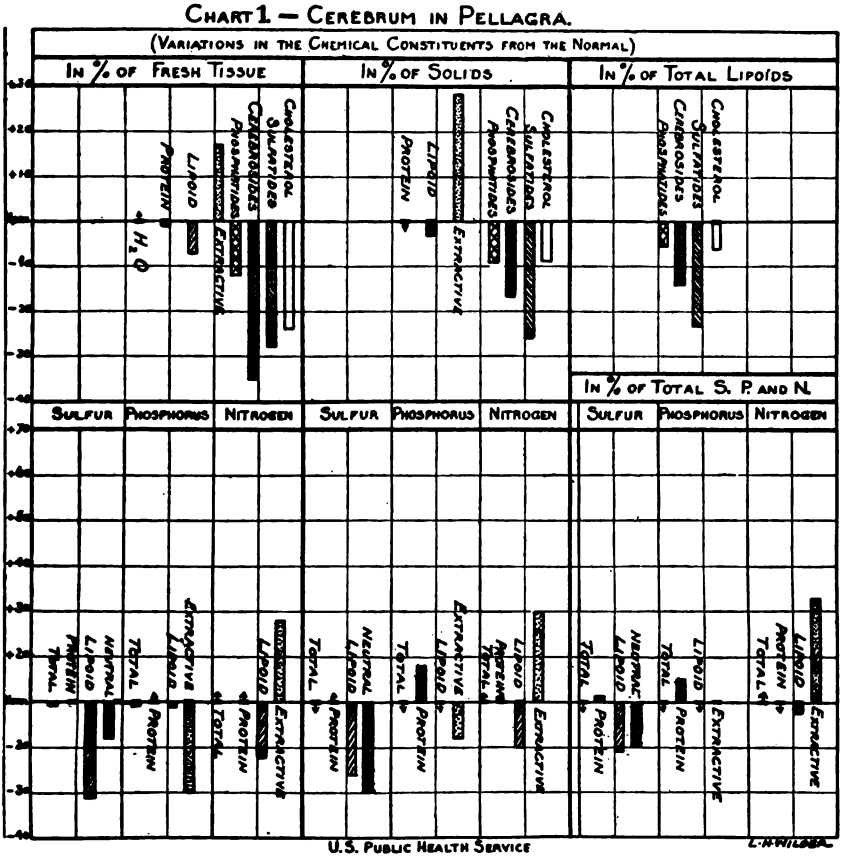
INTERPRETATION OF RESULTS AND EXPLANATION OF CHARTS.

In order to interpret the tables it is necessary to call attention to the fact that in comparing the pathological tissue with the control it is well to keep in mind that variations exist in both, which are partly due to individual differences in the composition of the organ in different individuals. Allowance should also be made for the analytical errors. For this latter reason percentage variations smaller than 10 were disregarded in the preparation of the charts of the sulphur,



phosphorus, and nitrogen distribution. The arrows in the charts may represent, therefore, in some instances in reality a more decided change than the one actually indicated. The authors, however, were of the opinion that it is more rational to be conservative in the interpretation of the analytical results.

The inorganic sulphur was not included in the charts, as the absolute amount of this constituent is so extremely small that a slight

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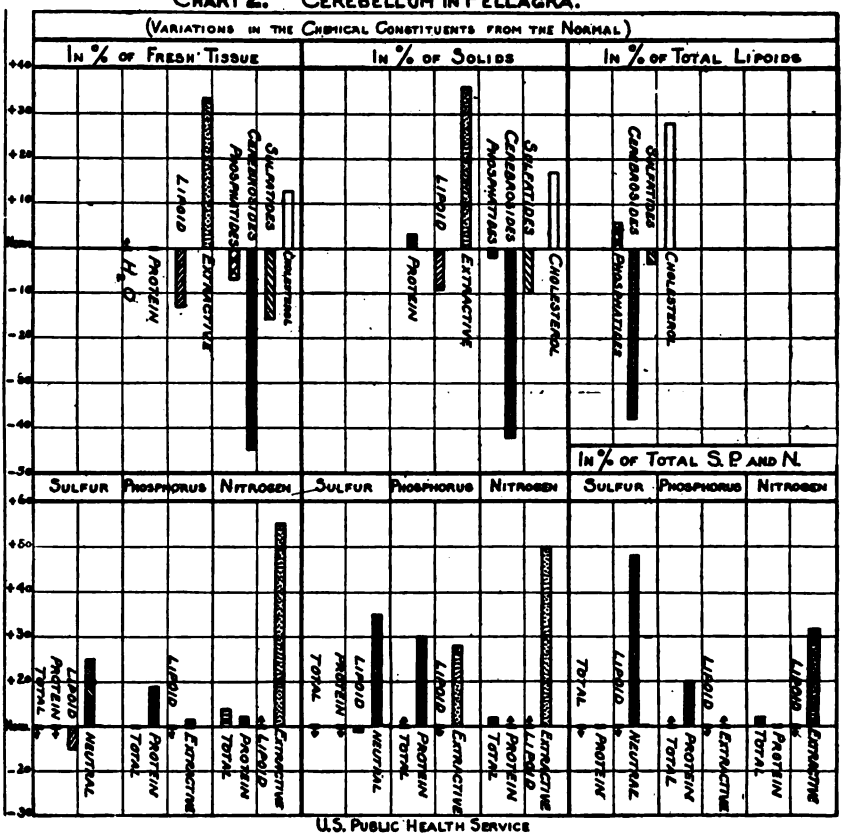
error in analysis might indicate a considerable change, whereas in reality no such change may have occurred.

The charts represent the average percentage variation of all cases studied.

CHART 2. CEREBELLUM IN PELLAGRA.



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DISCUSSION OF RESULTS.

WATER.

The most striking increase in the water content is noted in the spinal cord (6 per cent). In the cerebellum only a tendency for the water to increase is observed, and in the cerebrum it shows no percentage variation from normal. According to Donaldson, the increase in water in nervous tissue is a measure of the degree of the pathological change which has taken place. Accepting this interpretation of Donaldson in the case of pellagra, there evidently exists a close agreement between the degree of histological change and the

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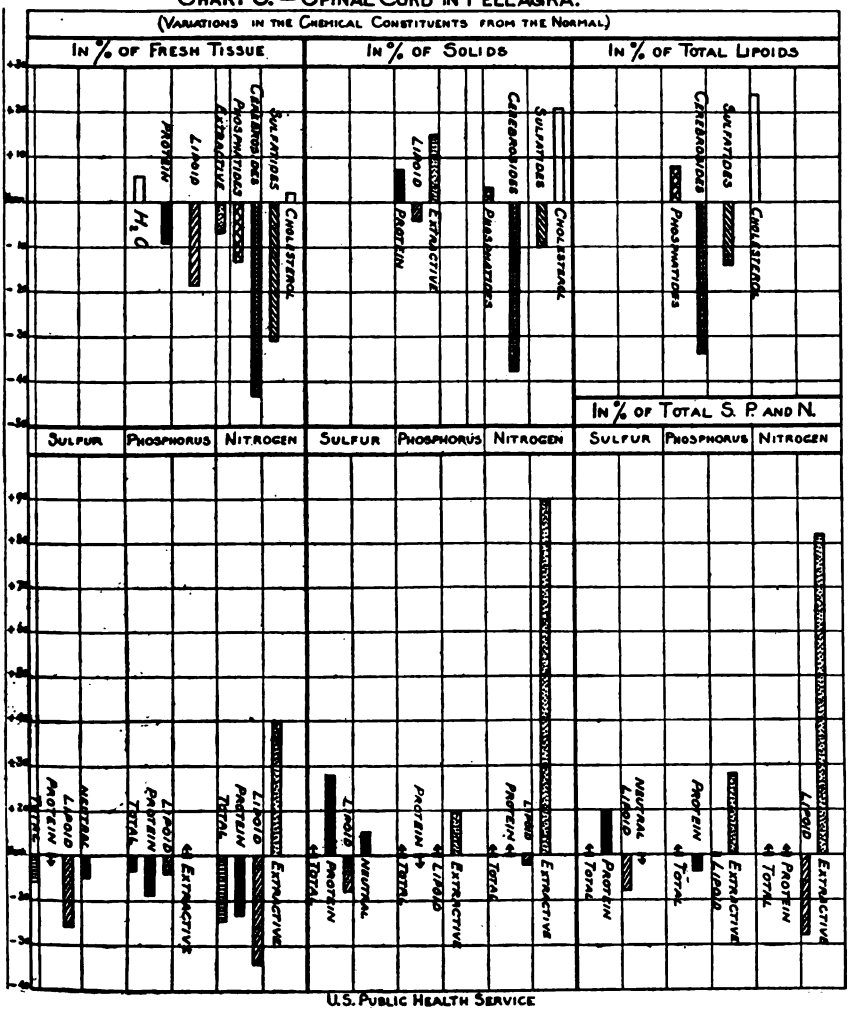
change in the water content found in the different parts of the central nervous system, these changes being most pronounced in the spinal cord. The only other data relating to the water content of the brain in diseases of the nervous system are those of Pighini, who

CHART 3.—SPINAL CORD IN PELLAGRA.



states that the water of the brain in general paralysis is much increased. (See also Barrat, Arch. Neurol., 1899, I, 207, who found the water increased in this disease.)

PROTEINS.

There seems to exist a relation between the water and protein content of the tissue in the sense that with an increase of water in the fresh tissue the proteins are correspondingly decreased. The most

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striking change is found in the spinal cord, it is less marked in the cerebellum, and in the cerebrum there is no change in either the water or protein content. In the dry tissue (per cent of solids) this relation is reversed, inasmuch as the tissue, which in the fresh condition contained the highest amount of water and the lowest amount of protein, now contains the highest amount of protein (spinal cord). Pighini also found an increase in the protein content of the brain in general paralysis, a condition associated with extensive degeneration.

The considerable increase of *protein sulphur* in the dried spinal cord may possibly be explained as follows: The sulphur-containing protein of nervous tissue is mainly, if not wholly, represented by *neurokeratin*, which, as was stated in the chapter on the physiological significance of the various chemical constituents of nerve tissue, is a relatively physiologically inert substance, which serves as the supporting structure of the medullary sheath. The spinal cord is part of the central nervous system, which is richest in medullated fibers, the cerebrum comes next, and the cerebellum contains the least. On the assumption that with the degeneration of nerve fibers the inert neurokeratin is not broken down to such an extent as the other constituents of the fiber, it is evident that the percentage variation of protein sulphur in the tissues showing marked degeneration would become evident by a relative increase in protein sulphur. On the basis of this explanation the apparent increase in protein sulphur in the spinal cord in pellagra is not an absolute increase in the sense that there has taken place as the result of pathological conditions an increase in neurokeratin, but the increase in protein sulphur is rather relative, as other cellular material has been removed from the tissue, which would result in a corresponding increase of the neurokeratin. The protein sulphur in the cerebrum is found to be normal. In the cerebellum a slight tendency to decrease is noticed in this constituent.

The *protein phosphorus*, which may be considered as representing *nucleoprotein*, is found normal in the spinal cord and is slightly increased in the cerebrum. In the cerebellum, the part of the central nervous system richest in nuclei, there is noted a considerable increase in this constituent. As in the case of the neurokeratin, this apparent increase can not be interpreted on the assumption that an increased synthesis of neucleoproteins has taken place in pellagra, but, rather, that most of the nuclear material has remained in the cell, whereas the other cellular constituents, as the result of degeneration, have been removed. In this way the content of the tissue in nucleoprotein seems to be increased. The protein nitrogen has a tendency to increase in the spinal cord and in the cerebellum. In the fresh tissue this increase in protein nitrogen runs parallel with the increase in protein sulphur, and is probably due to the relative increase in

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neurokeratin in the cord. In the cerebellum the increase of the protein nitrogen follows the increase of protein phosphorus, and can be attributed to the relative increase of nucleoprotein. In the cerebrum the protein nitrogen is found to be normal.

LIPOIDS.

The greatest loss in total lipoids in the fresh tissue is observed in the spinal cord, less so in the cerebellum, and still less in the cerebrum. Approximately the same relation of water to lipoid content exists in these tissues as was described for the relation of water to protein; that is to say, the increase in water in the fresh tissue tends to decrease the total lipoids or vice versa. The *cerebrosides in the cerebellum*, spinal cord, and cerebrum are considerably decreased in the order given. This decrease is practically the same in the fresh tissue, in per cent of solids and in per cent of lipoids. As was shown by Lorraine Smith and Mair,[1] and by Waldemar Koch and M. L. Koch,[2] the cerebrosides increase very markedly in the growing animal as medullation proceeds, pointing to an intricate relationship of the medullated sheath and the cerebrosides. This is furthermore emphasized by the work of Smith and Mair,[3] who were able to show that the staining of the myelin sheath by means of Weigert's method may be considered as being due to the content of the sheath in cerebrosides. The marked decrease in cerebrosides observed in all parts of the central nervous system agrees, therefore, very well with the considerable amount of degeneration of nerve fibers found in pellagra. In this connection it is interesting to call attention to the observation of other authors on the cerebroside content of the brain in various diseases of the central nervous system. Smith and Mair[4] found, in three cases of general paralysis, a marked decrease of cerebrosides (50 per cent); this observation was also made by Pighini[5] in this disease. In two cases of secondary degeneration in hemiplegia an even more marked decrease in the cerebrosides content (75 per cent) was observed in the degenerated areas. The loss in cerebrosides as the result of degeneration of nerve fibers under pathological conditions is in marked contrast with the increase of the cerebroside content of the nervous system as the result of growth. In the two conditions opposite effects are obtained—growth leading to an increase, degeneration leading to a decrease in these lipoids.

The *lipoid sulphur* and the *sulphatides* exhibit a considerable diminution in the spinal cord, cerebrum, and cerebellum, the loss being most marked in the spinal cord and least in the cerebellum. Here

[1] Smith, L., and Mair, Jour. Path. and Bact., 1912, XIII, 123.
[2] Koch, W., and Koch, M. L., Jour. of Biol. Chem., 1913, XIV, 267.
[3] Smith, L., and Mair, Jour. Path. and Bact., XV, 179–181.
[4] Smith L., and Mair, Jour. Path. and Bact., 1911, XVI, 131.
[5] Pighini, G., Biochem. Zeitschr., 1914, LXII, 317.

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again, as in the case of the cerebrosides, the tissue richest in medullated nerve fibers and containing under normal conditions the largest proportion of sulphatides, shows the greatest loss of this substance as the result of pellagra. The *sulphatides*, according to our present knowledge, are important constituents of the medullary sheath. The degeneration of this tissue element would therefore lead to a loss in sulphatides. The phosphatides show the least change of the individual lipoids. In the fresh cord a diminution is noted. In the solids the phosphatides are practically normal. In the cerebellum the phosphatides have a tendency to decrease, and in the cerebrum they show a slight decrease.

The *cholesterol* in the fresh tissue of the spinal cord is normal. In per cent of solids, however, a marked increase (22 per cent) is noted, which is still more pronounced in per cent of total lipoids. As the water content of the spinal cord is markedly increased, the increase of cholesterol in per cent of total lipoids, together with the decrease in the other lipoids and the increase in proteins and extractives, points to an absolute increase of cholesterol.[1] Cholesterol seems therefore to take the place of the sulphatides and cerebrosides, since the phosphatides are not markedly decreased. Similar changes in the cholesterol content are found to a much less marked degree in the cerebellum. In the fresh cerebrum the cholesterol is considerably decreased in spite of the absence of an increase in the water content. In per cent of solids this decrease is less marked, and in per cent of total lipoids cholesterol is found to be normal. The decrease in cholesterol may be relative, as the extractives are found considerably increased in both the fresh and dried cerebrum and as the cholesterol is found normal in per cent of total lipoids.

The relative increase in cholesterol may perhaps be considered as a compensatory protective function on the part of the degenerating tissue for the purpose of counteracting the considerable loss in other lipoids (cerebrosides, sulphatides, and phosphatides).

Although our knowledge of the physiological function of cholesterol is by no means cleared up, certain observations seem to point out the possibility that cholesterol, under certain conditions can prevent toxic cytolysis.

It is interesting, in this connection, to call attention to the observation of Pighini in general paralysis. This author finds a very marked increase in the cholesterol in the dried brain, a still more marked increase in per cent of total lipoids, whereas in the fresh encephalon the cholesterol is normal. Pighini believes that the white matter is not affected in its cholesterol content, as the cortex is the part of the brain which is mainly subjected to degeneration in this disease. The cortex, however, seems to retain its original cholesterol,

[1] One could consider this condition as a true "cholesterol-verfettung."

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whereas water takes the place of the other lipoids which are removed from the cells of the cortex.

Smith and Mair also observed a great increase in cholesterol in the degenerated areas in two cases of hemiplegia. It will be seen that the changes in the cholesterol content of the spinal cord in pellagra agrees very well with the observations made by Pighini on the brain in general paralysis, and those of Smith and Mair in cases of hemiplegia. Extensive degeneration seems to lead to an increase in the cholesterol in the dry tissue and in per cent of total lipoids, whereas in the fresh tissue the cholesterol is found normal, partly because the increase in water compensates for the loss in other lipoids (cerebrosides, sulphatides, and phosphatides). The changes in the cholesterol content of the cerebrum in pellagra, however, are just the opposite from those found in general paralysis and hemiplegia. This last observation is perhaps explained by the fact that the degeneration of the brain in pellagra is by no means as extensive as in general paralysis and hemiplegia.

EXTRACTIVES.

The extractives are increased most in the fresh cerebellum (33 per cent) and less so in the fresh cerebrum (17 per cent). In the fresh spinal cord we find a decrease in extractives (—6 per cent). In the dry cerebellum and cerebrum the increase in extractives is still more marked, whereas in the dry spinal cord we find now an increase in extractives. As was stated in the chapter of the chemical constituents of nervous tissue, the extractives may be considered as an index of the degree of metabolism of the tissue. An increase in extractives in pellagra might therefore be interpreted on the basis of an increased metabolic activity on the part of the cells. The cleavage products of the cellular constituents under these conditions might accumulate in the tissue. This view point seems somewhat irrational, as the blood would tend to remove such metabolic products. On second consideration, however, this increase in extractives might be explained in a more satisfactory way as follows: The marked loss of the nervous tissue in certain lipoids, which are known to be hydrophobic substances, might lead to an increase in the water content of these tissues. This accumulation of water would secondarily produce a retention of inorganic and organic extractives in order to equalize the physico-chemical conditions inside and outside the cell.

This conception of the relation between lipoids on one side and water and extractives on the other seems to agree with the changes observed in these constituents as a result of growth. W. Koch and M. L. Koch call attention to the remarkable decrease in the water content of the encephalon of the albino rat between birth and 20 days after birth. The increase in lipoids and the decrease in ex-

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tractives run parallel with the decrease in water. These authors, however, attribute the increase in extractives to the increased metabolism during this period of rapid growth.

Child[1] suggests that senescence is due to the accumulation of colloidal material which would tend to interpose resistance to metabolism. If the views of this author were correct the changes observed in pellagra might be considered as a return of the nervous system in this disease to a more youthful stage, an assumption which seems hardly justifiable.

The *neutral sulphur* is decreased in the fresh cerebrum and spinal cord and increased in the fresh cerebellum. In the dried cerebrum the neutral sulphur is markedly decreased; in the dried cerebellum a decided increase is noted and in the dried spinal cord this constituent shows only a slight increase. In per cent of total sulphur the neutral sulphur shows a marked increase in the cerebellum in several cases, a decrease in the cerebrum and a tendency to decrease in the spinal cord.

W. Koch and Mann observed a decrease of the neutral sulphur in the brain in dementia precox, whereas in general paralysis, melancholia, and meningitis this constituent was found normal. In conclusion it may be noted that in pellagra there is no consistent change in the neutral sulphur in the different parts of the central nervous system. In the cerebrum, however, the neutral sulphur seems to show the same tendency to decrease as in dementia precox.

The *extractive phosphorus* is practically normal in the fresh tissue and markedly increased in the dry cerebellum and spinal cord. In the dry cerebrum a considerable decrease of noncolloidal phosphorus is noted. In per cent of total phosphorus the extractive phosphorus is practically normal in the cerebrum and cerebellum, with an increase in the spinal cord.

In the *extractive nitrogen* a constant considerable increase is noted in all parts of the central nervous system, pointing to a retention of noncolloidal nitrogenous cleavage products of cellular constituents.

CONCLUSIONS.

Extensive chemical analyses of the central nervous system in five cases of uncomplicated pellagra, as compared with normal controls, revealed the following principal abnormalities:

1. A tendency for the water to increase, a loss of lipoids, and a tendency for the proteins slightly to decrease.

2. A decrease in the cerebrosides, phosphatides, and sulphatides, which is probably due to an increased lipolytic process, associated with the degeneration of the tissue.

[1] Child, C. M., Arch. f. Entwicklungs. Mechanik. d. Org., 1911, XXXI, 571.

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3. A relative increase in the cholesterol content of the cerebellum and spinal cord.

4. A diminution of the cholesterol in the cerebrum.

5. The proteins seem to be the least affected of all the constituents. They are present in normal amounts in the cerebrum and cerebellum. In the spinal cord a decided increase is noted in the dry tissue, whereas in the fresh tissue the proteins are decreased.

6. A considerable increase in extractives, which compensate for the loss of lipoids; the nitrogen containing noncolloidal extractives are especially responsible for this increase in total extractives.

A tentative explanation, dealing with this increase in extractives is advanced. According to this conception, the increase in extractives is due to a loss of the pathological tissue in certain hydrophobic lipoids, as the result of an increased lipolysis. This reduction in lipoids would tend to increase the water content of the tissue, which secondarily would give rise to a retention of substances causing a rise in osmotic pressure.

7. A loss of neutral sulphur in the cerebrum and spinal cord, and an increase in this constituent in the cerebellum, which may possibly be interpreted as a disturbance of the oxidative power of the colloidal sulphur compounds.

In a general way *the spinal cord exhibits the most striking chemical changes, a fact which is in perfect agreement with histological observations.* The chemical changes in pellagra, while similar in many respects, differ from those in other diseases affecting the central nervous system.

The present investigation brings out the fact that the central nervous system in pellagra is subjected to a series of considerable chemical changes involving principally certain lipoids. The study of these changes from a chemical point of view has led to a new method of characterization of this disease, which may permit to correlate them, as has been shown in the preceding investigation, with the changes experimentally produced in the nervous system of animals.

ACKNOWLEDGMENTS.

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HYGIENIC LABORATORY BULLETINS OF THE PUBLIC HEALTH SERVICE.

The Hygienic Laboratory was established in New York, at the Marine Hospital on Staten Island, August, 1887. It was transferred to Washington, with quarters in the Butler Building, June 11, 1891; and a new laboratory building, located in Washington, was authorized by act of Congress March 3, 1901.

The following *bulletins* [Bulls. Nos. 1–7, 1900 to 1902, Hyg. Lab., U. S. Mar.-Hosp. Serv., Wash.] have been issued.

*No. 1.—Preliminary note on the viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 2.—Formalin disinfection of baggage without apparatus. By M. J. Rosenau.

*No. 3.—Sulphur dioxid as a germicidal agent. By H. D. Geddings.

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No. 5.—An investigation of a pathogenic microbe. (*B. typhi murium* Danyz applied to the destruction of rats. By M. J. Rosenau.

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†No. 7.—Laboratory technique: Ring test for indol, by S. B. Grubbs and Edward Francis; Collodium sacs, by S. B. Grubbs and Edward Francis; Microphotography with simple apparatus, by H. B. Parker.

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Since the change of name of the service the bulletins of the Hygienic Laboratory have been continued in the same numerical order, as follows:

*No. 8.—Laboratory course in pathology and bacteriology. By M. J. Rosenau. (Revised edition, March, 1904.)

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*No. 10.—Report upon the prevalence and geographic distribution of hookworm disease (uncinariasis or anchylostomiasis) in the United States. By Ch. Wardell Stiles.

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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

HYGIENIC LABORATORY—BULLETIN No. 104

FEBRUARY, 1916

INVESTIGATION OF THE POLLUTION AND SANITARY CONDITIONS OF THE POTOMAC WATERSHED

WITH SPECIAL REFERENCE TO

SELF PURIFICATION AND THE SANITARY CONDITION OF SHELLFISH IN THE LOWER POTOMAC RIVER

By

HUGH S. CUMMING

PLANKTON STUDIES
By W. C. PURDY
and
HYDROGRAPHIC STUDIES
By HOMER P. RITTER

WASHINGTON
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INTRODUCTION.[1]

In the exercise of its constitutional powers, the Congress of the United States has, during the century and a quarter of its existence, passed numerous laws regulating the use of the navigable waters of the country as highways of interstate commerce. There is, however, so far as is known, no Federal law dealing with the pollution of interstate streams. Those who have suffered injury in person or property in consequence of such pollution must, it seems, ground their right to redress on the general principles of the common law or on statutes of the States.

Many of our States have placed upon their statute books laws to control the pollution of streams. Such laws have not only not interfered with the development of communities or the growth of their industries, but have also served to protect the health and decrease the death rate of their citizens.

Nevertheless, there are certain sanitary problems which, because of their magnitude or character, are national in scope and their solution devolves upon the Federal Government. One of the most important of these problems is the investigation of the pollution of navigable waters. Recognizing this need, Congress passed an act, which was approved August 14, 1912, providing among other things that the Public Health Service shall study "the pollution, direct or indirect, of the navigable waters of the United States."

Request for investigation of Potomac.—Under this authority the Surgeon General, with the approval of the Secretary of the Treasury, immediately began to arrange for the investigation of certain types of interstate waters. In the meantime, however, a joint communication under date of October 8, 1912, from the governor of Maryland and the governor of Virginia, and a communication of October 14, 1912, from the president of the Board of Commissioners of the District of Columbia, invited attention to the importance of investigations to determine the extent of the pollution of the Potomac River, and requests were made that a comprehensive study of the subject be undertaken by the United States Public Health Service.

These requests followed the publication of somewhat widely read statements that the sewage from the city of Washington and other communities along the Potomac River polluted the waters of the lower river to such an extent that there was danger of contracting

[1] Manuscript submitted for publication Jan. 14, 1915.

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water-borne diseases, such as typhoid fever, by eating raw oysters taken from the extensive and valuable oyster beds which extend from Lower Cedar Point, about 65 miles below the sewer outlets of Washington, to the mouth of the river, which is about 100 miles below the outlets.

The District of Columbia was interested both because many of the oysters from the lower river are distributed and consumed in Washington, and because suggestions had been made that an elaborate sewage-disposal plant, to cost several millions of dollars, be installed for the treatment of Washington sewage.

Further reasons for studying Potomac.—Besides the requests from the authorities of Maryland, Virginia, and the District of Columbia, there were other reasons for studying the river. In connection with the International Joint Commission, Surg. McLaughlin, of the Public Health Service, was studying the pollution of the Great Lakes; and it had been determined by the service to study the pollution of the Ohio River as a type of inland stream with diversified pollution and with a number of communities dependent upon its waters for drinking purposes; and it was also desirable to study a tidal stream and estuary such as the lower Potomac.

Scope of the investigation.—In undertaking the investigation it was planned to secure data which might be applied, first, to the general problems encountered in sanitary investigations of waterways, and, second, to the peculiar problems of this river, which require solution. Both the general and the specific problems require for their settlement accurate information concerning two factors—the pollution and the purification.

Concerning the pollution, it is necessary to know its origin, character, and quantity. These are determinable by sanitary surveys, combined with certain morbidity data and biological and chemical studies. The data thus obtained must be submitted to critical analysis to determine in just what ways, if any, the pollution constitutes a sanitary menace. For example, a certain industrial waste must not be dismissed as having no sanitary significance merely because it is not poisonous and does not contain disease germs; it must be considered whether this waste contributes to the exhaustion of purifying agencies which might otherwise have been applied to the dissipation of disease-bearing pollution. After having made certain hydrographic, biological, and chemical studies, one is in a position to estimate the potency of the natural purifying agents.

The sanitary status of the waterway may be very accurately estimated from a consideration of the balance between the pollution and the purification under varying conditions; and, moreover, if the conditions are found to require remedy, the data for practicable measures to relieve the situation are ready at hand.

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The instructions issued on December 24, 1912, by the Surgeon General of the Public Health Service, with the approval of the Secretary of the Treasury, contained the following:

The investigations in question will be undertaken through the hygienic laboratory. They should comprise an intensive sanitary survey of the entire Potomac River watershed. The watershed below Washington will require a very intensive survey, involving water examinations both bacteriologically and chemically, the samples to be taken regularly at many sampling points along the river. While the preliminary survey and the examinations of samples of water will be first undertaken, other problems will ultimately have to be considered, such as the effects of dilution and the natural agencies of purification upon the polluted water in given distances of stream flow and the effect of the sewage pollution in reducing the dissolved oxygen in the water.

After necessary conferences by officers of the State Board of Health of Virginia and the Public Health Service, and with the advice of Prof. William T. Sedgwick, who occupies the chair of biology and public health in the Massachusetts Institute of Technology and is a member of the advisory board of the hygienic laboratory, it was decided to collect data which may be classified as follows:

A. *Data on the gross physical characters of the river and its catchment basin:*
   (*a*) The watershed—areas, rainfall, run-off.
   (*b*) The tributaries—daily discharge.
   (*c*) The river proper—topography, cross sections, gradients, stream flow, scour.
   (*d*) The estuary and its tidal basins—areas, volumes, tides, float data, scour, winds, volumes.

B. *Data on the pollution of the river:*
   (*a*) The water—
      1. Sanitary survey data—typhoid fever prevalence, amount and character of sewage, trade wastes, and surface wash.
      2. Physical and chemical data—suspended matter and turbidity, free ammonia, chlorine, salinity, oxygen, putrescibility, residue.
      3. Biological data—total bacterial count, *B. coli* count, plankton data, higher aquatic life.
   (*b*) The bottom mud—
      Physical, chemical, and biological data.
   (*c*) Shellfish industrially important—Oysters; extent of industry, total bacterial count, *B. coli* count.

C. *Data on the natural purification of the river:*
   (*a*) The water; (*b*) the bottom mud—Physical, chemical, and biologic data similar to or derived from the foregoing, especially amount of dilution, the time factor, sources of oxygen, plankton data, aquatic plant life, oxygen determinations, total bacterial count, *B. coli* count.

It transpired, as had been foreseen, that the methods employed were subjected to tests as to their value during the investigation, since, where several methods were employed for the solution of the

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same general problem, they acted as checks upon each other. No method was servilely followed, it being desired to learn something as to the value of current practices at the same time that the river was investigated. More intimate details as to the scope of the investigation and of the methods employed are given in their appropriate sections throughout the report.

There have been, both in this country and abroad, many exhaustive studies of the pollution of rivers and shellfish beds and many studies of industrial wastes. A careful survey of available literature, however, has disclosed no reported investigation which has attempted a study of an entire river over a period of a year and embracing so many of the problems involved in the pollution of rivers.

Organization.—In the letter already quoted it was directed that the director of the hygienic laboratory, Surg. John F. Anderson, should "assume supervision over the investigations to be made by officers attached to the laboratory."

Surg. H. S. Cumming was designated to have immediate charge of the field work. He had the assistance of Asst. Surg. W. F. Draper, in immediate charge of a temporary laboratory established at Colonial Beach, Va.; Sanitary Engineer Harry P. Letton, who, with Surg. Cumming, made the sanitary survey of the watershed; and Sanitary Chemist W. F. Wells and Sanitary Bacteriologist Henry V. Stewart, who were from time to time engaged in both field and laboratory work. Biologist W. C. Purdy made the studies of the plankton and vegetable life of the river.

Following the appointment of Prof. Earle B. Phelps as chief of the division of chemistry of the hygienic laboratory, the investigators have had the advantage of his advice and assistance.

The great importance of certain hydrographic data concerning the estuary portion of the river resulted in the request being made of the Superintendent of the Coast and Geodetic Survey to furnish assistance. Accordingly Mr. Homer P. Ritter, who has had large experience in making such observations, was detached from the Mississippi River Commission and assigned to this work. He organized a field party, which began work in August, 1913.

Acknowledgments.—The officers in charge of the investigation desire to express their appreciation of the assistance given by the officers of the Coast and Geodetic Survey; by the Director of the Geological Survey in furnishing valuable figures as to run-off and daily discharge of the river and its tributaries above Great Falls; by the Commissioner of Fisheries and his staff in extending courtesies, including the loan of apparatus for securing deep-sea samples; by Prof. C. F. Marvin, Chief of the Weather Bureau, in furnishing data as to daily weather conditions in Washington; by Dr. W. T. Sedg-

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wick, of the Institute of Technology, Boston; by the State health officers of Maryland and Virginia in furnishing maps and information as to the prevalence of typhoid fever; by the State commissioner of health of Pennsylvania in furnishing maps of certain districts of that State; by Dr. Francis E. Harrington, former health commissioner of Cumberland, Md., in permitting the use of the city laboratory; and by the officials of the Smithsonian Institution in the identification of certain mollusks.

Acknowledgments are due also to Mr. Asa E. Phillips, superintendent of sewers in the District of Columbia, who has cooperated most cordially and efficiently by furnishing the gasoline launch *Virginia* for the collection of samples, and who has supplied valuable data and daily samples of sewage for examination. As bacteriological examinations of water from the Great Falls intake are made daily at the laboratory of the Washington Filtration Plant, the records made available by the superintendent rendered the collection of samples at that point unnecessary.

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SUMMARY OF PREVIOUS INVESTIGATIONS.

In 1886 Theobald Smith made studies of the Potomac River water, during which he found that the bacterial count was greatest in periods of high water, consequent upon rain and wash, rather than in periods of low water, when the amount of concentration of sewage would necessarily be greatest. (Med. News, 1887, vol. 50, p. 404.)

In 1897 and 1898, in accordance with a Senate resolution, Drs. Kinyoun and Sprague, of the Marine Hospital Service (now the Public Health Service), made a study of the pollution of the Washington water supply.

In 1898 the United States Geological Survey, in accordance with a Senate resolution, made a hydrographic survey of the Potomac River watershed above Washington. In connection with the work samples were collected from 55 points on the river above Washington and analyzed. The results of this investigation were published in Senate Documents Nos. 90 and 211, Fifty-fifth Congress, second session, and in the report of the Marine Hospital Service for 1898.

In 1905 Mr. Marshall O. Leighton reported the result of a study of the pollution of the river above Great Falls by sewage and industrial wastes, and considered it increasing and dangerous to the water supply of Washington. (U. S. Geol. Survey, 1900, S. Doc. No. 181, Mar. 1, 1905.)

In his presidential address before the Medical Society of the District of Columbia Mr. Thomas N. McLaughlin called attention to the importance of the pollution of the river to the city of Washington. (Wash. Med. Annals, January, 1906.) Illustrating some of the chief sources of pollution, he particularly mentioned as of growing importance the danger of infection from oysters fattened in freshwater estuaries.

Lieut. Col. A. M. Miller, Corps of Engineers, United States Army, submitted a report upon the "Feasibility and propriety of filtering the water supply of Washington," which included a study of the relation of Potomac River water to typhoid fever. Chemical and bacteriological analyses of the river water are given in this report. In it Mr. Robert Spurr Weston also summarized much bacteriological and chemical data and gave the character and composition of the Potomac River water. (S. Doc. No. 259, 56th Cong., 1st sess.)

Messrs. Parker, Willis, Bolster, Ashe, and Marsh in 1907 made a study of the "geographical history, rain, and stream flow, pollution, typhoid fever, and character of the water; relation of soils and forest

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cover to quality and quantity of surface water and effect of industrial wastes on fishes." The study was an exhaustive one, and included a sanitary survey of the basin down to Washington, but did not include any study of the bacterial life of the river, nor did it include the Potomac Basin below Washington. (U. S. Geol. Survey, Water Supply and Immigration Paper 192.)

The Public Health Service has for a number of years been studying the Potomac River water and its influence upon the incidence of typhoid fever in Washington. During the "Investigation of the prevalence and origin of typhoid fever in the District of Columbia" in 1906 and 1907, a sanitary survey of the upper watershed was made by Goldberger and studies of the bacterial life were made by Frost (Hygienic Laboratory bulls. 35, 44, 52, and 78). In Hygienic Laboratory Bulletin 78, Lumsden and Anderson discussed the relation of shellfish to the spread of typhoid fever in the District of Columbia. Anderson and Creel studied the bacteriology of oysters from the lower river and bay in 1910, but no report has been published.

Fairly constant bacteriological and turbidity records of the water at the city intake above Great Falls are made by the District authorities and are available in the annual reports of the Chief of Engineers, United States Army. The Corps of Engineers has made an exhaustive study of hydraulic data of the river with special reference to the generation of power at the falls. (Report on water supply, District of Columbia, H. Doc. No. 1400, 62d Cong., 3d sess., 1913.)

So far as known to us the only studies of the bacteriology and chemistry of the river below Washington have been those made by Dr. G. W. Stiles, of the Bureau of Chemistry, Department of Agriculture, upon one or two trips, and a joint investigation upon three trips made by representatives of the Bureau of Chemistry and the States of Maryland and Virginia. The results of these investigations have not been published.

The Bureau of Fisheries has made studies of the fish life in the river, but no plankton studies have heretofore been made.

It will thus be seen that, while many studies have been made on different portions of the river and upon isolated sanitary and economic problems presented by it, no coordinate effort has been made to collect and interpret sanitary data of the river as a whole so that the interplay of the various factors could be comprehensively understood. There have been two questions which, because they affected the largest groups of persons, have elicited all previous sanitary investigations of the Potomac River. The first of these is: Is the water of the upper Potomac so dangerously polluted as to be unsuitable, when untreated, as a water supply for the city of Washington?

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This has repeatedly been answered in the affirmative, and as a consequence an elaborate sedimentation and filtration plant has been installed. The second question is: Is the water of the lower Potomac so dangerously polluted that edible shellfish cultivated therein are unsuitable for food? This has not perhaps been conclusively answered up to the present time.

The additional questions may be roughly summarized as follows: How, and to what extent, do rivers of which the Potomac is a type become polluted? What are the natural forces tending to dissipate this pollution and how do they operate? And, finally, What is the result from a sanitary viewpoint of the interaction of pollution and natural purification?

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PHYSICAL AND ECONOMIC FEATURES OF THE POTOMAC RIVER.

It will be necessary at different places throughout this report to consider more intimately certain features which might well be grouped under the above heading. What follows is intended merely to afford a bird's-eye view of the river, so that the reader may be better oriented in perusing the subsequent sections. (See map No. 1.)

Because the Potomac presents two very distinct portions, with contrasted physical and sanitary features, it can conveniently be described as consisting of the upper and the lower river.

The upper river.—The upper river is comparatively narrow, fast flowing, though tortuous, flanked by steep banks or mountains, and is crossed here and there by dams and rapids. It receives many tributaries having on a smaller scale the same gross features as itself. It is formed about 25 miles below Cumberland, Md., by the junction of the north and the south branches of the Potomac and flows, with many crooks and turns, in a general southeasterly direction for a distance of 153 miles, to the Great Falls, where it tumbles over an irregular rocky shelf, forming the beginning of the lower river.

The tributaries of the upper river flow along the valleys between the mountain ridges of the Appalachian and Allegheny ranges, and hence those entering from the south flow in a northeasterly direction and those from the north flow in general southwesterly. The main stream cuts at right angles through the hills and mountains.

The watershed thus drained varies geologically from the granite sheds of the upper streams to the limestone regions of the Cumberland and Shenandoah. It contains areas of uninhabited virgin forest, highly cultivated agricultural land, and communities varying from isolated mountain hamlets to towns of considerable size and manufacturing importance. Beside the sewage of these communities, the river and its tributaries receive the surface wash of cultivated fields and the waste matter from many varied industries, important among which are mining, tanning, pulp milling, distilling, and dye manufacturing. The tributaries of the upper river arise in four States—i. e., Pennsylvania, Maryland, West Virginia, and Virginia.

The lower river.—In strong contrast with that portion of the stream just described, the lower river is broad, its relatively slow current does not flow constantly in one direction, but oscillates back and forth with the tide from Chesapeake Bay, and its windings are

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less numerous, though on a greater scale. It receives few tributaries having the characters of flowing streams, but the broad shallows which border the deep main channel extend in many places over the adjacent flat lands, forming extensive tidal basins, rank with aquatic vegetation. Such flowing streams as do enter the river are often loaded with highly colored red clay in suspension.

Near the upper end of the lower river is the city of Washington, which discharges the untreated sewage of over 300,000 inhabitants into the river. Aside from this and the sewage from Alexandria the pollution is relatively unimportant, as there are few manufacturing establishments to contribute their wastes.

As the waters of the river approach the bay they become mixed with the salt water brought up by the tides, furnishing excellent conditions for the cultivation of oysters when the required degree of salinity has been reached. The oyster industry in the lower reaches of the river is large and important.

Politically the lower portion of the Potomac is unique. The National Capital is at its head and in its course it separates the States of Maryland and Virginia, which States have joint jurisdiction over the riparian rights of the stream. This portion of the river is essentially an estuary and will be frequently referred to as such.

No detailed description of the streams entering the Potomac nor of the communities of the watershed will be given at this place. The course of the former and the location of the latter can be found in the various maps and details will be given in the later sections, especially that on the sanitary survey. Table No. 8 summarizes the populations and areas of the watershed.

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POLLUTION OF THE POTOMAC RIVER.

Regarded from a sanitary standpoint there can be no doubt that the pollution of streams which conveys the microbial cause of certain "water-borne" diseases is still the most important. This is because so many communities in this country continue to drink, bathe in, and eat shellfish cultivated in, waters thus polluted without adequate preliminary treatment. In the United States typhoid fever is the disease most frequently contracted in this manner, while certain types of dysentery and malignant diarrheas of children are strongly suspected of having at times a similar origin. There is always a possibility of chance contamination with the causative agents of Asiatic cholera and certain diseases which we commonly associate with the Tropics—a possibility which, although admittedly remote, must be ever borne in mind in view of our large European immigration and the return of our tropical workers.

It must be remembered, however, that many diseases which we do not class as "water-borne" have been shown to exhibit a remarkable diminution following improvements in the water supply—the Mills-Reinike phenomenon.

There are again other diseases, notably endemic goiter, which are still under a reasonable suspicion of association with certain, or rather uncertain, saline constituents of drinking water.

The pollution introduced by industrial wastes, even though it be not poisonous or otherwise pathogenic, is by no means a matter of indifference to sanitarians. It may constitute a distinct menace by exhausting the natural purifying agencies of the stream, which otherwise would be utilized in overcoming the pathogenic pollution; and, on the other hand, it may in certain fortuitous or intentional combinations actually act itself as a purifying agent, an example of this action being given in this report.

There is another manner in which gross pollution of streams act, although indirectly, as a distinct sanitary menace. An unsightly, ill-smelling stream encourages insanitary practices along its banks. Rubbish which may breed and attract flies and rats is deposited without compunction on the banks of such a stream, insanitary privies are built there, and the construction of the better and more sanitary type of buildings is distinctly discouraged. This contention is not far-fetched; its correctness can readily be verified.

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In this survey it was realized that the question of pollution was much more important in certain portions of the river than in others, and the attempt was made so to distribute the activities as to obtain a maximum of essential information rather than to secure uniformity of observation in all possible directions, much of which would have little practical significance, at the sacrifice of much time, money, and effort. For this reason, direct observations of the kind and amount of pollution entering the river preponderate as regards the upper river, while bacteriological and chemical studies take precedence in the lower river.

In the following account of a sanitary survey of the Potomac watershed the data on typhoid fever are illustrative rather than complete. It was found that to ascertain the prevalence of the disease with exactness by survey methods would necessitate a house-to-house survey in many parts where the disease is very prevalent, but the population is scattered along narrow valleys and in mountainous regions. Such a survey would have required a large force of trained epidemiologists and a period of time not available for the present study. Furthermore, the compiled results would have had only historic interest, for happily the unfortunate sanitary conditions on the watershed are rapidly being improved. The illustrative observations are supplemented, however, by official reports from the State health organizations. Although in estimating the pollution of a stream the methods of field observations and laboratory study can not be divorced, it has been found convenient to consider them separately at first.

POLLUTION AS SHOWN BY A SANITARY SURVEY IN THE FIELD.

This sanitary survey attempted to determine to what extent the towns of the watershed are served by public water supplies and the source and amount of the supplies; the points at which pollution, either town sewage or trade wastes, enters or could enter the main stream or its tributaries, and the nature and extent of this pollution; and the prevalence of typhoid fever so far as ascertainable by practicable methods.

The general topography of the river has already been outlined. By reference to map 1 the location of the towns visited in the survey can be readily ascertained, since they are arranged systematically, beginning at the headwaters of the tributaries mentioned.

NORTH BRANCH OF THE POTOMAC RIVER.

This arises at the extreme southwestern corner of Maryland, near the West Virginia boundary, and flows in a northeasterly direction

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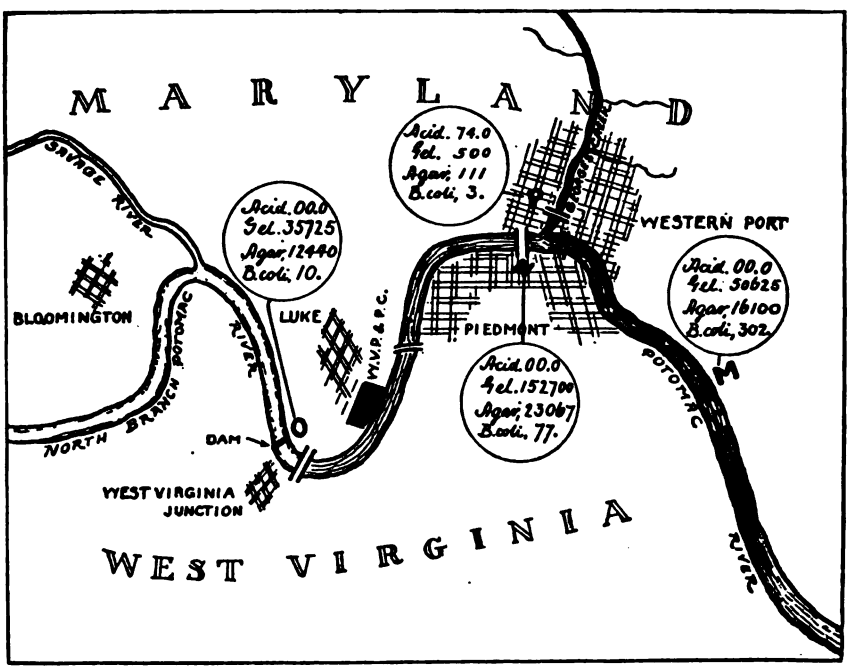

MAP NO. 2.—VICINITY OF PIEDMONT, WESTERNPORT, LUKE, AND BLOOMINGTON, WITH SAMPLING POINTS AND THE RESULTS OF ANALYSES OF WATER THEREFROM.

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for a distance of about 60 miles, to Cumberland, Md. Here it bends sharply to the southeast and some miles below it joins with the South Branch to form the Potomac proper. As a whole, the watershed is mountainous, but it is nevertheless fairly heavily populated, the larger portion of the inhabitants being engaged in mining and lumbering. Most of the communities are located directly on the streams. Gormania, W. Va., with a population of about 400, marks the first point at which direct pollution occurs. The town has wells and insanitary privies. At a tannery owned by the A. G. Hoffman Sons Co. about 150 hides are tanned daily. It was stated that all of the tan liquor was used repeatedly, and that none was discharged into the river. The lime wastes were discharged into a pit on the river bank, to be hauled away, it was said, at frequent intervals and used for fertilizer. The water in the river was somewhat discolored by tan liquor which had escaped. Dr. G. W. Drinkwater stated that "typhoid fever was common three years ago, but there have been only a few (six or seven) cases this year" (1913). Below this village the valley is narrow, and the small mining hamlets of Wallman, Gleason, Dobson, Shaw, and Harrison are strung out along the stream, with privies overhanging the river. Acid coal-mine wastes enter the stream from Gormania to Shaw. At Blaine, W. Va., and Kitzmillerville, Md., which together form a community (divided by the river, which is only 50 to 100 feet wide) of about 1,200 people, there is no public water supply or sewerage system. The stream is here polluted by several private sewers and overhanging privies and by the wash from several mines. Dr. Copeland, physician to the neighboring mines, stated that within a radius of 6 miles up and down the river from Blaine there were about 2,500 people, among whom there had been 15 cases of typhoid fever (one having been imported from Philadelphia) during the period January–October, 1913. Three years before there were over 300 cases of typhoid fever, of which 167 had been treated by himself.

Bloomington, Piedmont, Westernport (see map 2).—Bloomington, a community of 200 people, obtains a water supply to the extent of about 30,000 gallons a day from Piedmont, 2 miles below. It has no system of sewerage, but undoubtedly sewage finds its way into the streams. Dr. Kalbaugh, health officer of Westernport, stated that in 1911 and 1912 typhoid fever had occurred in nearly every family in Bloomington, and attributed cases in Piedmont to water thus contaminated. The Savage River, which enters the North Branch at Bloomington, drains a sparsely inhabited region, and at present affords an apparently excellent water supply for the town of Piedmont, and will shortly be utilized also for Westernport. About 2 miles below the mouth of the Savage River is the dam of the West Virginia Pulp & Paper Co., at Luke, Md., a town made up almost

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entirely of the employees of this company. There is a public water supply obtained from the condensers at the paper mill. There is no sewerage system, but the sewage from the mill is discharged into the river. The mill wastes amount to about 23,000,000 gallons daily, and consist of lime, spent bleach, and clay used in sizing. These wastes markedly change the character and appearance of the river water. At times of very low water in the river the mill takes the entire flow and discharges a river of waste, and at the time of inspection, October, 1913, the river half a mile below the mill resembled a river of milk, due to the large amount of lime waste. Apparatus is being installed to save a large amount of this waste, and when this is in operation the appearance of the river will doubtless be improved. There was formerly (1910–11) so much typhoid fever in Luke that the operation of the mill was interfered with. Since the use of distilled water from the condensers the disease has practically disappeared.

Piedmont, W. Va., and Westernport, Md., are situated on opposite sides of the river about a mile below Luke. Piedmont, having a population of 2,054,[1] has a municipally owned water supply, derived from the Savage River about 5 miles above its mouth. At the time of the inspection this supply also furnished water in part to Westernport and Bloomington. Piedmont and Westernport together use about 510,000 gallons daily. Practically the entire town of Piedmont is sewered, the sewage discharging into the North Branch. The same is true of Westernport, which has a population of 2,702. Dr. Kalbaugh, of Piedmont, said that there had been 150 cases of typhoid fever, with a mortality of 10 per cent, as a yearly average for the past three years in the towns of Luke, Piedmont, and Westernport, which aggregate about 6,000 inhabitants. In his opinion this undue prevalence was caused by the occasional supplementing of the Savage River supply by pumping in water from the North Branch. The health officer of Westernport stated that 36 cases of typhoid, with 6 deaths, had been reported between May 13, 1913, and October 13, 1913. Two years previous to that time "the disease was prevalent and in severe form." During the year 1914 there was another outbreak. The results of bacteriological studies in this region are indicated in Map 2.

Georges Creek.—Georges Creek, which joins the North Branch at Westernport, has its source about 15 miles northwest therefrom, at Frostburg, Md. The watershed is very thickly settled, small towns being located in an almost continuous line throughout the length of the valley. Frostburg, a town of 6,028 inhabitants, has a public water supply derived from springs along the Savage River near its

[1] Where actual population figures are given they are taken from the 1910 census.

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source, about 4 miles west of the city. The daily consumption is 350,000 gallons. A public sewerage system serves about one-half of the town, the sewage being discharged into Georges Creek. Compulsory sewer connections are being made and the vicious system of disposing of sewage by discharging it into old mines and cesspools is being abandoned. There are important bituminous coal mines throughout the valley, especially at the upper end, discharging large amounts of acid iron wastes into the streams, which are consequently highly colored with iron oxide and devoid of living things. Dr. J. Marshall Price and Dr. Griffith, health officers of Frostburg, stated that very little typhoid fever had originated in the town since the installation of the present water supply. For several years, however, one section seemed thoroughly infected, although its water and milk supplies and sewage disposal were the same as for the rest of the city. Upon investigation by the State and city health officials a house was discovered in which, during several years, every member of the family had had typhoid fever. The locality was cleaned up, and 200 people received antityphoid inoculation. Since that time the only case occurring was in a young man who had refused typhoid vaccination. At Eckhart, an old mining town of 1,200 people, about 1 mile east of Frostburg, typhoid fever was formerly very prevalent, but it is now rare. A recently constructed tunnel drains the mines into Braddock's Run.

Midland, Md., about 4 miles below Frostburg, with a population of 1,173, has a public water supply derived from springs on Elk Lick Run. The water is impounded in an open reservoir of 2,000,000 gallons capacity. The average daily consumption is 85,000 gallons. There is no sewerage system, but sewage doubtless finds its way into the creek. Dr. Charles, the health officer, stated that before the installation of the present water supply typhoid and epidemic meningitis had occurred for 25 years. There has been no typhoid since two years ago, when there were two cases, and meningitis is now uncommon.

The town of Lonaconing, with 1,553 inhabitants, is situated about 4 miles farther downstream. The town has a public water supply derived from springs and two surface streams, Koontz Run and Jackson Run, tributary to Georges Creek. The total storage provided by these two supplies is 7,000,000 gallons, and the average daily consumption about 150,000 gallons. Practically the entire town within the corporate limits is sewered, the sewage being discharged through several outlets into Georges Creek. Dr. Bullock, the health officer of Lonaconing, stated that 10 cases of typhoid fever had been reported from January 1 to October, 1913.

The mine waters probably exert a precipitating and germicidal action on the sewage of Georges Creek, since the waters of this

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stream at their entry into the North Branch are of good quality as regards dangerous pollution. This acid iron water of Georges reacts chemically with the lime-laden water of the North Branch, causing the precipitation of iron hydrate, which carries down with it large amounts of organic matter. This action undoubtedly has an important effect upon the character of the water below this point.

Keyser.—Returning to the North Branch, the next place of importance is Keyser, W. Va., with a population of 3,705, situated about 5 miles below Piedmont. A municipally owned public water supply, derived from mountain springs 5 miles distant, furnishes water for the town. The storage reservoir at the springs has a capacity of 35,000,000 gallons. The town is sewered for the most part. This sewage and that from many private sewers is discharged into New Creek, which flows through the town, giving it a disagreeable appearance and odor. Piles of garbage and fecal matter line its banks. While the water of the North Branch immediately above Keyser is quite clear, it becomes very unsightly after receiving the sewage from private sewers and from the Baltimore & Ohio Railroad shops, and, like that of New Creek, harbors the gray fungus characteristic of sewage-polluted water. The Patchett Woolen Mills, located on the river bank, contribute large quantities of wool scourings and spent dyes, which at times markedly discolor the water for some distance below. Dr. W. H. Yeakley, the health officer, who has since died, stated that 15 cases of typhoid fever had been reported in Keyser from January to October, 1913, which was the smallest number in years.

From Keyser to Cumberland, a distance of about 18 miles, no direct pollution reaches the stream. At the latter point the pollution is so important, both qualitatively and quantitatively, that Sanitary Chemist W. F. Wells was detailed to make an intensive study of the situation. In order to preserve the geographical sequence his findings will be inserted at this point.

Cumberland.—Cumberland is situated in a natural basin which receives the drainage of a large area, in which extensive mining and paper-pulp industries contribute great quantities of their respective wastes to the pollution of the streams. With good transportation facilities, cheap coal, and natural gas, Cumberland and the surrounding towns are well located for industrial development and the support of a concentrated population. Within a radius of a few miles are industrial plants including a pulp mill, distillery, tannery, dye works, gas plant, and breweries. The wastes from these sources and the sewage which is discharged into the streams constitute a complex pollution which demands closer study. This study has been facilitated by the use of the city laboratory, which was generously permitted by the city authorities.

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The principal features of the problem are graphically indicated in map 3. It will be seen that the North Branch of the Potomac River makes a very sharp turn, forming an inverted V, at Cumberland, which is situated on its north bank. This is converted into an inverted Y by the entrance of Wills Creek from the north. The dam across the river just below this point is for the purpose of maintaining a sufficient head in the river to supply the Chesapeake & Ohio Canal, which begins here in a number of irregular basins. The flow from Wills Creek is directed to a large extent into the canal, and in times of low water it is said that the entire flow of the North Branch passes into the canal and none over the dam. The angle formed by the limbs of the Y is occupied by Knobly Mountain, through the base of which a railroad tunnel has been cut, which emerges at points some 2½ miles upstream and downstream, respectively, from the city. Wills Creek before it reaches the city contains strongly acid iron wastes. About three-quarters of a mile above the opening into the canal it receives a discharge of tan liquor, which precipitates black iron tannate, causing a discoloration of the water which can be traced down to the canal. The North Branch at the mouth of Wills Creek contains more or less alkaline calcium salts in solution, but since the canal is fed principally by water from the creek, it follows that the canal waters are acid and highly charged with iron compounds at the start. Either directly or indirectly, most of the sewage of the city reaches the canal. About one-half of the sewage from ward 1 goes into Wills Creek and half into the North Branch; approximately two-thirds of that from ward 2 flows into the creek, while the other third and all the sewage from wards 3, 4, 5, and 6 flow directly into the canal. The large canal basins, with their sluggish current, serve as settling basins for the sewage, which, moreover, receives chemical treatment by contact with the iron-laden water. This results in a heavy precipitation of the suspended matter. The iron sulphate acts not only as a precipitate and coagulant, but also as an oxygen carrier. The four atoms of oxygen in the molecule of sulphate are given up in the oxidation of organic matter, with a resulting precipitate of insoluble iron sulphide. The extent of this process can be judged from the fact that while the canal is in use one dredge is kept continually in operation removing the deposited sludge, which consists largely of iron sulphide. This is dumped into the river, where the excess of oxygen gradually reconverts it into sulphate.

Another reaction which takes place is that between the tannic-acid wastes from the Union Tanning Co. and the iron water, which results in a black discoloration and precipitate. On contact with the strongly reducing wastes from the James Clark Distilling Co. ferrous sulphate

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is formed, producing a brilliant green discoloration. The ammoniacal waste from the gas works further tends to neutralize the acid water. Footer's Dye Works discharge some 40,000 gallons of wash water and spent dye into the canal daily. The interaction of all these chemical substances is naturally complex and variable, with quantitative fluctuations, but the final effect is to produce heavy precipitates, which carry down suspended organic matter with them and which can be removed by dredging.

Specimens were taken at various points, as shown in map 3, and examined bacteriologically and chemically in order to estimate the influence of the various pollutions and wastes on the sanitary condition of the water. These samples include some from the Piedmont region (see map 2) in order to show the condition of the water before the entrance of the wastes at Cumberland. During the time of taking specimens (April) there were frequent rains, which caused marked changes in the condition of the river and some irregularity in the findings. The results are given in tables 1 and 2, and the summaries are shown on map 3.

TABLE 1.—*The results of bacteriological examinations of water in the vicinity of Cumberland, Md., 1915.*

Place and date.	Sample No.	Bacteria per c. c.		B. coli in broth.				
		Agar.	Gelatin.	10 c. c.	1 c. c.	.1 c. c.	.01 c. c.	.001 c. c.
Canal bridge at tunnel below Cumberland:								
Apr. 13	AA	1,300	.....	.....	.....	+	.....	.....
Apr. 17	AA	100	1,200	.....	+	.....	.....	.....
Apr. 23	AA	110	950	.....	+	.....	.....	.....
Apr. 27	AA	325	2,300	.....	.....	.....	+	.....
Apr. 28	AA	250	12,500	.....	+	.....	.....	.....
May 3	AA	35	550	.....	+	.....	.....	.....
Average per c. c.	.....	353	3,500	1.9				
Potomac bridge at tunnel below Cumberland:								
Apr. 13	A	350	.....	.....	.....	−	.....	.....
Apr. 17	A	325	1,600	.....	.....	+	.....	.....
Apr. 23	A	90	275	.....	−	.....	.....	.....
Apr. 27	A	650	17,500	.....	−	.....	.....	.....
Apr. 28	A	2,300	18,500	.....	.....	+	.....	.....
May 3	A	85	425	.....	+	.....	.....	.....
Average per c. c.	.....	633	7,660	4.4				
Potomac bridge below canal dam at Cumberland, east pier:								
Apr. 15	A_1	950	3,900	.....	.....	−	.....	.....
Apr. 20	A_1	800	11,000	.....	+	.....	.....	.....
Apr. 24	A_1	120	650	.....	−	.....	.....	.....
Average per c. c.	.....	623	5,183	.7				
Potomac bridge below canal dam at Cumberland, middle pier:								
Apr. 14	A_2	450	9,500	.....	.....	+	.....	.....
Apr. 15	A_2	2,500	13,500	.....	.....	.....	.....	.....
Apr. 20	A_2	1,100	17,500	.....	+	.....	.....	.....
Apr. 22	A_2	75	750	.....	.....	+	.....	.....
Apr. 24	A_2	300	800	.....	.....	+	.....	.....
Average per c. c.	.....	885	8,410	8.2				
Potomac bridge below canal dam at Cumberland, west pier:								
Apr. 14	A_3	350	1,600	.....	.....	−	.....	.....
Apr. 15	A_3	2,000	10,000	.....	.....	+	.....	.....
Apr. 20	A_3	75	4,800	.....	−	.....	.....	.....
Apr. 22	A_3	85	325	.....	+	.....	.....	.....
Average per c. c.	.....	628	4,181	3.0				

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TABLE 1.—*The results of bacteriological examinations of water in the vicinity of Cumberland, Md., 1915*—Continued.

Place and date.	Sample No.	Bacteria per c. c.		B. coli in broth.				
		Agar.	Gelatin.	10 c. c.	1 c. c.	.1 c. c.	.01 c. c.	.001 c. c.
Canal below canal dam at Cumberland:								
Apr. 9	A_4	3,100	.....	.....	.....	.....	+	.....
Apr. 15	A_4	1,300	5,000	.....	.....	−	.....	.....
Apr. 14	A_4	1,000	3,000	.....	.....	−	.....	.....
Apr. 20	A_4	150	1,100	.....	−	.....	.....	.....
Apr. 22	A_4	130	325	.....	+	.....	.....	.....
Apr. 24	A_4	150	475	.....	+	.....	.....	.....
Average per c. c.	.....	1,166	1,980	17.3				
Potomac bridge above Will's creek:								
Apr. 9	B	2,300	.....	.....	.....	.....	.....	+
Apr. 13	B	550	.....	.....	.....	−	.....	.....
Apr. 15	B	950	4,500	.....	.....	−	.....	.....
Apr. 14	B	1,000	8,500	.....	.....	−	.....	.....
Apr. 17	B	90	550	.....	+	.....	.....	.....
Apr. 20	B	550	22,500	.....	+	.....	.....	.....
Apr. 22	B	200	950	.....	.....	+	.....	.....
Apr. 23	B	.....	3,500	.....	.....	+	.....	.....
Apr. 24	B	200	800	.....	+	.....	.....	.....
Apr. 27	B	230	950	.....	.....	.....	+	.....
Apr. 28	B	2,700	17,500	.....	.....	+	.....	.....
May 3	B	275	1,600	.....	+	.....	.....	.....
Average per c. c.	.....	822	8,014	9.5				
Potomac above Cumberland at tunnel:								
Apr. 13	C	250	.....	.....	.....	−	.....	.....
Apr. 15	C	1,600	5,500	.....	.....	+	.....	.....
Apr. 17	C	170	750	.....	+	.....	.....	.....
Apr. 23	C	.....	100	.....	+	.....	.....	.....
Apr. 27	C	475	1,800	.....	.....	.....	+	.....
Apr. 28	C	1,100	1,200	.....	.....	+	.....	.....
May 3	C	350	1,900	.....	.....	+	.....	.....
Average per c. c.	.....	658	1,975	19				
Wills Creek at Baltimore Street Bridge:								
Apr. 9	D	700	.....	.....	.....	.....	+	.....
Apr. 13	D	250	.....	.....	.....	+	.....	.....
Apr. 14	D	150	1,400	.....	.....	−	.....	.....
Apr. 15	D	2,000	13,500	.....	.....	+	.....	.....
Apr. 17	D	150	350	.....	.....	.....	.....	.....
Apr. 20	D	130	350	.....	−	.....	.....	.....
Apr. 22	D	70	220	.....	+	.....	.....	.....
Apr. 23	D	.....	325	.....	+	.....	.....	.....
Apr. 24	D	95	375	.....	.....	+	.....	.....
Apr. 27	D	65	400	.....	−	.....	.....	.....
Apr. 29	D	55	375	.....	+	.....	.....	.....
Average per c. c.	.....	367	1,933	13.4				
Wills Creek at B. & O. roundhouse:								
Apr. 9	E	130	.....	.....	−	.....	.....	.....
Apr. 17	E	75	80	.....	−	.....	.....	.....
Apr. 22	E	13	550	+	.....	.....	.....	.....
Apr. 27	E	89	140	−	.....	.....	.....	.....
Apr. 29	E	18	110	+	.....	.....	.....	.....
Average per c. c.	.....	55	220	.04				
Wills Creek above Braddocks Run:								
Apr. 9	F	160	.....	+	.....	.....	.....	.....
Apr. 17	F	140	325	−	.....	.....	.....	.....
Apr. 22	F	16	140	+	.....	.....	.....	.....
Apr. 27	F	46	190	.....	+	.....	.....	.....
Apr. 29	F	11	275	.....	.....	+	.....	.....
Average per c. c.	.....	75	232	2.2				
Braddocks Run above Wills Creek:								
Apr. 9	G	31	.....	.....	−	.....	.....	.....
Apr. 9	G	50	.....	.....	+	.....	.....	.....
Apr. 17	G	120	230	.....	−	.....	.....	.....
Apr. 22	G	4	30	−	.....	.....	.....	.....
Apr. 27	G	13	32	−	.....	.....	.....	.....
Apr. 29	G	15	75	−	.....	.....	.....	.....
Average per c. c.	.....	39	92	.2				
Potomac, one-half mile below Piedmont:								
Apr. 11	M	.....	2,000	.....	.....	.....	.....	+
Apr. 18	M	800	1,500	.....	.....	+	.....	.....
Apr. 28	M	15,000	19,000	.....	.....	.....	+	.....
May 3	M	332,500	180,000	.....	.....	.....	+	.....
Average per c. c.	.....	16,100	50,625	302				
Potomac bridge above Georges Creek:								
Apr. 11	N	.....	9,000	.....	.....	.....	+	.....
Apr. 18	N	1,200	1,800	.....	.....	+	.....	.....
Apr. 28	N	31,000	200,000	.....	.....	.....	+	.....
May 3	N	37,000	400,000	.....	.....	.....	+	.....
Average per c. c.	.....	23,067	152,700	77				

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TABLE 1.—*The results of bacteriological examinations of water in the vicinity of Cumberland, Md., 1915.*

Place and date.	Sample No.	Bacteria per c. c.		B. coli in broth.				
		Agar.	Gelatin.	10 c. c.	1 c. c.	.1 c. c.	.01 c. c.	.001 c. c.
Potomac above dam at pulp mill, Luke:								
Apr. 11	O	.....	1,500	.....	.....	+	.....	.....
Apr. 18	O	200	600	.....	.....	+	.....	.....
Apr. 28	O	120	800	.....	.....	+	.....	.....
May 3	O	37,000	140,000	.....	.....	+	.....	.....
Average per c. c.	.....	12,440	35,725	10				
Georges Creek Bridge above Potomac:								
Apr. 11	P	210	.....	.....	.....	+	.....	.....
Apr. 18	P	120	1,100	.....	+	.....	.....	.....
Apr. 28	P	65	450	.....	−	.....	.....	.....
May 3	P	48	450	.....	−	.....	.....	.....
Average per c. c.	.....	111	500	30				
Canal at sewer near Footer's Dye Works:								
Apr. 14	aa	500,000	.....	.....	.....	.....	.....	+
Wills Creek below tannery effluent:								
Apr. 9	bb	1,300	.....	.....	.....	.....	.....	+
Wills Creek at North Lee Street Bridge:								
Apr. 9	cc	120	.....	.....	−	.....	.....	.....
Tan liquor from vat:								
Apr. 9	dd	11	300	.....	−	.....	.....	.....
Mud from bed of canal:								
Apr. 22	xy	260,000	850,000	.....	.....	.....	.....	−
Apr. 27	xw	70,000	65,000	.....	.....	.....	−	.0001
Cumberland city water, raw (Lake Gordon):								
Apr. 23	ee	475	.....	−	.....	.....	.....	.....
Settled water, Cumberland filter plant:								
Apr. 23	ff	39	.....	−	.....	.....	.....	.....
Cumberland filtered water at filter:								
Apr. 23	gg	15	.....	−	.....	.....	.....	.....
Cumberland tap water at laboratory:								
Apr. 23	hh	28	.....	−	.....	.....	.....	.....
Distillery wastes:								
Apr. 9	ii	37,500	.....	.....	−	.....	.....	.....
Apr. 9	ii	5,000	.....	.....	−	.....	.....	.....
Apr. 22	ii	27,500	45,000	.....	−	.....	.....	.....
Apr. 27	ii	250,000	200,000	.....	+	.....	.....	.....
Apr. 29	ii	10,000	9,000	.....	.....	+	.....	.....
Feb. 17	ii	10,000	30,000	.....	−	.....	.....	.....
Average per c. c.	.....	56,667	94,667	.....	.....	.....	.....	.....
Potomac below discharge of pulp mill:								
Apr. 28	kk	35,000	.....	.....	.....	.....	+	.....
Lake Gordon (Cumberland water supply):								
May 7	LL	1,600	.....	−	.....	.....	.....	.....

TABLE 2.—*Showing results of chemical analyses of water from the vicinity of Cumberland, Md.*

Station number.	Location.	Date.	Acidity.	Alkalinity.	Iron.	Oxygen dissolved—		
						Before incubation.	After incubation.	Difference.
		1914						
A	Potomac bridge at tunnel below Cumberland	Apr. 13	78.0	.....	.....	.....	.....	.....
		Apr. 17	.....	.....	3.0	11.80	10.60	1.20
		Apr. 23	.....	10.0	.....	.....	.....	.....
		Apr. 27	6.0	.....	.....	.....	.....	.....
		Apr. 28	.....	.....	1.25	.....	.....	.....
	Average	.....	42.0	10.0	2.13	.....	.....	1.20
AA	Canal, bridge at tunnel below Cumberland	Apr. 13	59.0	.....	.....	.....	.....	.....
		Apr. 17	.....	.....	1.5	10.80	9.80	1.00
		Apr. 23	.....	4.0	.....	.....	.....	.....
		Apr. 27	1.0	.....	.....	.....	.....	.....
		Apr. 28	.....	.....	1.5	.....	.....	.....
	Average	.....	30.0	4.0	1.5	.....	.....	1.00

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TABLE 2.—*Showing results of chemical analyses of water from the vicinity of Cumberland, Md.*—Continued.

Station number.	Location.	Date.	Acidity.	Alkalinity.	Iron.	Oxygen dissolved—		
						Before incubation.	After incubation.	Difference.
		1914						
A_1	Potomac bridge below canal dam at Cumberland west pier	Apr. 15	2.0					
		Apr. 20		29.0				
	Average		2.0	29.0				
A_2	Potomac bridge below canal dam at Cumberland middle pier	Apr. 14	0.00					
		Apr. 15	4.00					
		Apr. 20		45.0				
		Apr. 22		21.5				
		Apr. 24		22.0				
	Average		2.00	41.70				
A_3	Potomac bridge below canal dam at Cumberland east pier	Apr. 14	42.0					
		Apr. 15	0.00					
		Apr. 20		14.0				
		Apr. 22		8.0				
		Apr. 24	21.0	8.0				
	Average		21.00					
A_4	Canal, Potomac bridge below canal dam at Cumberland	Apr. 14	75.0					
		Apr. 15	8.0					
		Apr. 20		9.0				
		Apr. 22		9.0				
		Apr. 24		7.0				
	Average		41.50	12.5				
B	Potomac bridge above Wills Creek	Apr. 13	0.00					
		Apr. 14	0.00					
		Apr. 15	0.00					
		Apr. 17	0.00					
		Apr. 20		22.0	1.0	11.0	10.0	1.00
		Apr. 22		22.0				
		Apr. 23		24.0				
		Apr. 27		21.0				
		Apr. 28		21.0	.5			
	Average		0.00	22.0	.75			1.00
C	Potomac above Cumberland at tunnel	Apr. 13	0.00					
		Apr. 15	0.00					
		Apr. 17			1.3	10.70	10.20	.50
		Apr. 23		18.0				
		Apr. 24		25.0				
		Apr. 27		24.0				
		Apr. 28			.35			
	Average		0.00	22.3	.83			.50
M	Potomac, one-half mile below Piedmont	Apr. 11	0.00					
		Apr. 18	0.00		1.0	10.0	8.60	1.40
		Apr. 28	0.00		2.0	9.20	8.80	.40
	Average		0.00		1.5			.90
N	Potomac bridge above Georges Creek	Apr. 11	0.00					
		Apr. 18			1.2	9.40	8.80	.60
		Apr. 28			.8	9.90	7.10	2.80
	Average		0.00		1.0			1.70
O	Potomac at dam above pulp mill at Luke	Apr. 11	0.00					
		Apr. 18			1.0	10.00	9.40	.60
		Apr. 28				9.40	9.40	.00
	Average		0.00		1.0			.30
P	Georges Creek bridge above Potomac	Apr. 11	74.00					
		Apr. 18			5.0	9.40	9.40	0.00
		Apr. 28			15.0	8.60	8.40	.20
	Average		74.00		10.0			.10
D	Wills Creek at Baltimore Street Bridge	Apr. 13	79.00					
		Apr. 14	98.00					
		Apr. 15	28.00					
		Apr. 17			3.4	11.00	10.60	.40
		Apr. 20		9.5				
		Apr. 22		7.0				
		Apr. 23		4.0				
		Apr. 24		5.0				
		Apr. 27	8.0					
	Average		53.2	16.37	3.4			.40

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TABLE 2.—*Showing results of chemical analyses of water from the vicinity of Cumberland, Md.*—Continued.

Station number.	Location.	Date.	Acidity.	Alkalinity.	Iron.	Oxygen dissolved.		
						Before incubation.	After incubation.	Difference.
		1914						
E	Wills Creek at Baltimore & Ohio roundhouse	Apr. 17	.....	.....	4.6	10.40	10.00	.40
		Apr. 22	.....	3.0	.....	.....	.....	.....
		Apr. 27	20.0	.....	.....	.....	.....	.....
	Average	.....	20.0	3.00	4.6	.....	.....	.40
F	Wills Creek above Braddocks Run.	Apr. 17	.....	.....	1.5	11.60	11.20	.40
		Apr. 22	.....	2.00	.....	.....	.....	.....
		Apr. 27	.....	12.00	.....	.....	.....	.....
	Average	.....	.....	7.00	1.5	.....	.....	.40
G	Braddocks Run above Wills Creek.	Apr. 17	.....	.....	21.6	9.80	9.50	.30
		Apr. 22	.....	2.00	.....	.....	.....	.....
		Apr. 27	20.4	.....	.....	.....	.....	.....
	Average	.....	20.4	2.00	21.6	.....	.....	.30

It appears from a consideration of these results that the sanitary condition of these waters is not nearly as bad as would be expected from mere inspection of the stream. The colon pollution is not excessive above the city where the water of Wills Creek has the most disgusting appearance, and the excess of *B. coli* noted immediately below the entrance of the sewers disappears a short distance down the canal and river. This reduction, moreover, is accomplished without exhausting the oxygenizing power of the river, which is restored by chemical reactions of the various commercial wastes. Here is an example of fairly efficient sewage disposal accomplished by a chance combination of wastes which so interact as to form purifying precipitates and oxygen-bearing compounds.

Cumberland now enjoys a new and improved water supply. It was installed in 1913, and it is believed that the typhoid incidence will be markedly reduced. The records of the Maryland State Board of Health show the following numbers of cases of typhoid reported in Cumberland during previous years: 1907, 121; 1908, 66; 1909, 118; 1910, 560; 1911, 320; 1912, 196; 1913, 160; June 1, 1913, to June 1, 1914, 299. Since the population of the town is about 22,000, it is evident that this constitutes an excessive prevalence of typhoid fever.

Area drained by Wills Creek.—Continuing the description of the watershed we will return briefly to the area drained by Wills Creek, the lower portion of which has been described. This stream rises about 25 miles north of Cumberland and receives its first pollution at the town of Hyndman, Pa., which has 1,164 inhabitants. A municipally owned water supply furnishes this town with about 40,000 gallons daily. The sewerage system, serving about 300 people, discharges into a small tributary of Wills Creek, and the latter at the time of inspection was in an offensive septic condition. Dr.

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Rees, the health officer, stated that there was an average of 8 or 10 cases of typhoid fever annually.

About 10 miles below Hyndman, near Corrigansville, Md., Jennings Run joins Wills Creek. This small stream receives the indirect drainage of the small village of Mount Savage, in addition to a considerable amount of mine drainage. Further mine drainage is received from Braddocks Run, 2 miles lower down, which contributes wastes from the Eckhart mines, Clarysville, and Allegheny Grove. At the latter place the James Clark Distilling Co., operating during six winter months, discharges about 150,000 gallons of fermented and spent mash daily. This is carried through pipe to Wills Creek near Braddocks Run. The sewage of about 100 people is discharged directly into the latter stream. The heavy pollution of the lower part of Wills Creek and the chemical changes which take place therein have already been described.

Below Cumberland the North Branch receives but two important tributaries—Evitts Creek and Pattersons Creek—neither of which introduces significant pollution; in fact, the dilution afforded, especially by Pattersons Creek, is decidedly beneficial.

SOUTH BRANCH OF THE POTOMAC RIVER.

This stream, which is the second of the two main branches of the Potomac, rises in Highland County, Va., and flows in a northeasterly direction for about 100 miles to join the North Branch. Its principal tributaries are the North Fork and the Moorefield River. The drainage area of 1,490 square miles supports a population of only 27,000 people—the sparsest peopled area of the entire Potomac watershed. The inhabitants are for the most part engaged in lumbering and agriculture.

Franklin.—The first point at which the river receives pollution is Franklin, W. Va., about 25 miles below the source. Franklin is a village with a population of about 500, although only 200 of these reside within the corporate limits. A municipally owned public water supply is derived from the river near the upper end of the town and is pumped to an open reservoir. About 20,000 gallons are used daily. A separate public water supply for drinking purposes has been in operation for over 100 years. Until very recently this water was distributed through pipes made by boring holes through logs. The supply system was controlled by a self-perpetuating board of directors. This supply is obtained from a covered spring near the center of the town and is piped by gravity through the streets, the water being obtained from hydrants placed at frequent intervals. The town is partially sewered by a public sewerage system, the

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sewage discharging into the river just below the point where the water supply is taken out. There are about 20 connections to the sewer. The only industry in Franklin is an old-fashioned cold-water tannery, with practically no liquid wastes. The Union Tanning Co. has purchased a site and a large amount of bark, with the intention of establishing a large tannery at this point. When this is in operation the river will undoubtedly receive a considerable amount of pollution. The six or eight cases of typhoid fever which occur annually seem to receive their infection from some constant source near the hotel.

From Franklin to Petersburg, W. Va., there is no direct pollution, with the exception of that from the small village of Upper Tract, the country being given over to farming and lumbering. Within a radius of seven miles of Upper Tract there live about 500 people, among whom, during the year 1913, there were 24 cases of typhoid, with 2 deaths, in the practice of Dr. Moore. The disease is almost wholly rural, as comparatively few cases seem to have occurred in towns and villages.

Petersburg.—Petersburg, W. Va., 30 miles below Franklin, is a town of about 500 population, without public water supply or sewerage system. It is the terminus of the Hampshire Southern Railroad, which runs between Romney, W. Va., and this point. The only industry of any importance is the tannery of the Union Tanning Co. This plant has a capacity of 110 hides per day, and tans only large hides for sole leather. The liquid wastes from the tannery, amounting to about 10,000 gallons per diem, are discharged into Lunice Creek. A settling pool has been constructed, through which all the wastes are supposed to pass, but at the time of inspection they were being discharged directly into the creek, which they discolored.

Moorefield.—About 11 miles below Petersburg, near the confluence of the South Branch and the Moorefield River, is situated the town of Moorefield, W. Va., with a population of 646. The town has a public water supply derived for the most part from the Moorefield River, although some water is obtained from a spring on a nearby mountain. The average daily consumption is about 15,000 gallons. The town is partly sewered, the sewage discharging into the river just below the town. There are about 20 connections to the sewer. About the same number of persons discharge sewage into a small open run which flows just back of the main street. The only industry of importance is the tannery of the Union Tanning Co., which is located about 2 miles southeast of the town on the Moorefield River. The tannery has a capacity of 90 hides per diem, and discharges about 10,000 gallons of liquid waste daily. This discharge is passed through two settling pools, which are emptied into the river during times of high water. The town water supply is pumped by the tannery, and

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is taken from the river just above the point where the wastes are discharged. The settling basins at the time of the inspection gave off a very offensive odor.

Romney.—About 22 miles below Moorefield is the next town of importance, Romney, W. Va., with a population of 1,112. There is a municipally owned public water supply derived from springs near Mill Creek, about 4 miles southwest from the town. Part of the town is sewered, the system being owned by a private corporation known as the Romney Sewer Co. The sewer is discharged over a high bluff into the river just below the town. There are 44 connections to the sewer, which serves about 250–350 people. The West Virginia School for the Deaf and Blind is located in Romney, and at the time of the inspection was obtaining its water supply from the town. A well was being dug, however, from which it was planned to obtain the supply. About 20,000 gallons of water are used daily by the school. The sewage from the school building is discharged by two pipe lines into Shanks Run, a small Creek, one line being about 600 feet and the other about 300 feet long. The discharge from the latter line flows a few hundred feet over the ground to the creek. At the end of the pipe there was an accumulation of feces, paper, and other waste matter. This is a condition which should not be allowed to exist, as a small sewage-disposal plant could be constructed here at slight expense.

Dr. Shull, the health officer, stated that typhoid fever was not common in Romney, there being but six or eight cases annually and but two in 1913, one of which was imported.

Area from Romney to mouth of South Branch.—From Romney to the mouth of the South Branch there is no more direct pollution.

Near the junction of the North and South Branches is a scattered group of 50 or 60 houses, called "Green Springs." Dr. Wynkoop stated that there was an average of at least five cases of typhoid fever per annum among the 250 inhabitants. The town uses surface wells and open privies.

POTOMAC RIVER BELOW THE JUNCTION OF THE NORTH AND SOUTH BRANCHES.

The sanitary conditions in the basin below the junction of these two branches are in general better than in the mountain sections already described. The country is more thickly settled and the local health officers can learn of and remedy insanitary conditions more readily, and the towns are better provided with water and sewerage systems.

Town Creek, Little Cacapon Creek, Paw Paw.—About 3 miles below the mouth of the South Branch Town Creek enters the Potomac

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River. This stream, which has a watershed of 150 square miles, rises in Pennsylvania and flows south. The population of the watershed is wholly rural in character. Three miles below the mouth of Town Creek Little Cacapon Creek enters the Potomac from the south. This stream has a watershed of 114 square miles, which supports a rural population of 157 persons per square mile. A few miles below the mouth of the Little Cacapon is the small town of Paw Paw, W. Va., where is located a tannery of the Union Tanning Co. About 45,000 large hides are tanned per year, although this is only about one-half of the capacity of the plant. The waste liquid, consisting of limewater, spent tan liquor, soak water, and wash water to the amount of about 50,000 gallons a day, is run into a pond having an area of about 3 acres. It was stated that the liquid would soak away and evaporate as fast as it was turned into the yard. At the time of inspection, however, there was a break in the dike and the waste was flowing directly into the river. There was considerable flow in the river at this time, but no discoloration was noticeable a few hundred feet downstream. It is alleged by residents in towns below the tannery that fishing has been ruined by the action of the wastes in the water.

Sideling Creek, Great Cacapon River.—Below Paw Paw the river follows a very tortuous course for about 26 miles, to a point where Sideling Creek enters from the north. There is no direct pollution in this latter stream, the watershed of which embraces an area of 95 square miles and supports a population of 38 per square mile. About 4 miles below the mouth of this stream the Great Cacapon River enters from the south. This tributary rises in the divide between Virginia and West Virginia and flows in a northeasterly direction along the west side of Great North Mountain, a distance of about 75 miles, to the Potomac. Its watershed has an area of 609 square miles. The country is mountainous and heavily timbered and supports an almost wholly rural population of 16.5 to the square mile. There is no direct pollution of the stream, the few communities being small.

Hancock, Berkeley Springs.—The town of Hancock, Md., is situated about 8 miles below the mouth of the Great Cacapon. This town has neither public water supply nor sewerage system, but has obtained permission from the State legislature to vote upon the proposition of issuing bonds for the construction of both. There is a private sewer discharging into the river, which serves two hotels, the Western Maryland station, and one or two other buildings. Opposite Hancock is the mouth of Warm Spring Run, a small tributary which receives the drainage of Berkeley Springs, a West Virginia community with a population of 864. This is a summer-resort town, and is the seat of a considerable industry in glass sand. The attrac-

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tion of the town is the thermal springs, which issue at a constant temperature of 74° F. The town has a public water supply derived from Warm Springs, the average daily consumption being about 72,000 gallons. A sewerage system serves 1,000 people and discharges into the creek. This stream is dammed at several points, forming pools. As a result the amount of pollution which reaches the river is slight.

Great Tonoloway Creek.—About 2 miles below Hancock is the mouth of Great Tonoloway Creek, which rises in Fulton County, Pa., and flows south. Its watershed has an area of 92 square miles and a population of 23.3 to the square mile. The next important tributary is Sleepy Creek, which rises in Frederick County, Va., and flows on the west side of Sleepy Creek Mountain. Its watershed has an area of 142 square miles and a population of 26.7 to the square mile.

Licking Creek.—Three miles below the mouth of Sleepy Creek Licking Creek enters from the north. This stream rises in Pennsylvania and flows almost directly south. It has a watershed of 187 square miles and a population of 36.1 to the square mile. The only town of importance on the stream is McConnellsburg, Pa., with a population of 579. A public water supply is derived from springs on Cove Mountain. The average daily consumption is about 20,000 gallons. There are no sewers in the town, the inhabitants depending upon privies and cesspools for the disposal of their wastes.

Back Creek.—Six miles below the mouth of Licking Creek, Back Creek enters from the south. Its watershed embraces an area of 279 square miles and has an almost wholly rural population of 30.9 persons to the square mile. The only village of note is Hedgesville, which has a population of 328. There is neither public water supply nor sewerage system at this point. From the mouth of Back Creek to that of Conococheague Creek there is only indirect pollution, the largest town being Clear Spring, Md., located on Tom's River, a branch of the Little Conococheague.

Conococheague Creek.—Conococheague Creek rises on South Mountain, in Adams County, Pa., and flows in a northwesterly direction to Scotland, Pa., where it turns and flows through a winding channel in a southwesterly direction to the Potomac near Williamsport, Md. The watershed embraces an area of 582 square miles and has a population of 45,694, or 77.5 persons to the square mile.

The South Mountain Sanatorium, a Pennsylvania State institution for the care of tuberculous patients, is located on South Mountain near Mont Alto, Pa. About 1,250 patients and attendants live at the institution. The water supply of about 100,000 gallons daily, derived from Little Antietam Creek, is treated with calcium hyperchlorite. The sewage from the institution, in daily amount about the

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same as that of the water supply, is carried to a sewage-disposal plant, which consists of septic tanks, sprinkling filters, sand filters, and provisions for final disinfection by calcium hyperchlorite. The effluent is then discharged into Rocky Mountain Creek, a small tributary of the Conococheague. The next point of importance is Scotland, Pa., which is a small town without water supply and sewerage system, but is the site of the State Soldiers' Orphans Industrial School. This institution of about 475 people derives its water supply of 100,000 gallons daily from a spring near the creek. The sewage is discharged into a circular 30,000-gallon dosing tank, where it is distributed over a tract of land about 5 acres in area. The system seems to be most satisfactory for an institution of this kind.

About 6 miles below Scotland is the city of Chambersburg, Pa., having a population of 11,800. A public water supply amounting to about 1,750,000 gallons daily is derived from mountain springs in the Pennsylvania Forest Reserve near the head of Conococheague Creek. The entire town has recently been sewered, but at the time of inspection only about 3,000 persons were served by the system.

The sewage is carried to a pumping station about a mile southwest of the town, where it is pumped to a complete modern sewage-disposal plant, consisting of an Imhoff sedimentation tank, a dosing chamber, a sprinkling filter, final sedimentation tanks, and a sludge bed. (Figs. 1, 2, 3, and 4.) The plant is well maintained and operated. It discharges a nonputrescible effluent into Conococheague Creek. From 700,000 to 1,000,000 gallons of sewage are treated daily.

Conococheague Creek, as it flows through the center of the city, receives a certain amount of direct pollution, as follows:

The wash water from the plant of the Cumberland Valley Creamery & Dairy Co.; about 150 gallons a week of spent lye from Gerbig's Soap Works; about 5,000 gallons of spent dye and soap water from the Home Woolen Co.; and the waste water from two slaughterhouses. About two miles below the city is the Hollowell Paper Mill, in which strawboard is made from wood pulp. The waste consists of a large quantity of wash water which contains soda ash. The privy used by 28 employees overhangs the tailrace, which joins the creek 200 yards below the mill.

Below Chambersburg the next town of considerable size is Greencastle, Pa., with a population of 1,900. A public water supply is derived from springs about 3 miles east of the town. The average daily consumption is 125,000 gallons. The town has no sewers, cesspools and crevices in the limestone formation beneath the town being used as receptacles of sewage. The practice of emptying into limestone caverns is a bad one from a sanitary viewpoint, as is well shown by the following incident: It was stated that previous to the installation of the public water-supply system the inhabitants of

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Greencastle obtained their supply from private wells. Now, the hotel near the town had a cesspool beneath the barn which had become full. It was decided to drill a hole in its bottom in order to obtain an outlet for the contents. When this was done the drill suddenly broke through into a fissure, and the contents of the cesspool ran out. Shortly afterward a man who was drawing a bucket of water from the town well in the square pumped up some of the sewage. A large number of the other wells in the town were also contaminated at the same time. The town was therefore compelled in self-defense to install a public water supply.

A few miles below Greencastle the west branch of the Conococheague Creek joins the creek proper. This stream rises about 15 miles north of Chambersburg and flows south along the east side of Tuscarora Mountain to near Mercersburg, Pa., where it turns and flows in a southeasterly direction to its junction with Conococheague Creek. For the greater part of its course the stream flows through a mountainous, wooded, almost uninhabited territory. The first point of direct pollution is at Foltz, on Buck Run, a small tributary entering the creek a few miles above Mercersburg. At Foltz is located Unger's distillery. This is a small plant, having less than 500 gallons of slop or spent mash a day. Practically all of this is fed to hogs in pens on the creek bank.

Mercersburg, Pa., with a population of 1,410, has a public water supply derived from Buck Run above Foltz. The town is partly sewered, one line being owned by the municipality and two by private companies. The sewage is discharged untreated into the small creek which flows through the town and meets Conococheague Creek about 2 miles to the east. The Mercersburg Academy, with about 450 persons, obtains its water supply and discharges its sewage into the same creek as does the town. The tannery of the W. D. Byron & Sons Co. (Inc.) is located on the creek in the town. This plant tans from 100 to 300 large hides per day, and has about 100,000 gallons daily of waste liquid. The wastes consist of spent tan liquor, soak liquor, limewater, and wash water. They are discharged into a pool in the tanyard, the contents of which are discharged into the creek at night. Some of the liquid, however, seeps into the stream at all times. As a result the water is rather highly colored and has an offensive appearance.

Below the mouth of the west branch the Conococheague flows in a winding course, receiving no direct pollution until just before it enters the Potomac River at Williamsport, Md., a town with a population of 1,511, without a public water supply or a sewerage system. A water supply, however, is soon to be installed. A tannery, owned by the W. D. Byron & Sons Co. (Inc.), is located at this point. Liquid wastes, consisting of 60,000 gallons a day of spent tan liquor, lime-

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water, soak water, wash water, aniline dye, and sumac, are discharged into a ditch which leads into the creek.

Opequon Creek.—About 9 miles below Williamsport, Opequon Creek enters the Potomac River from the south. This stream rises near Stephens City, Va., and flows in a northeasterly direction, for a distance of about 35 miles, to the Potomac. It has a watershed of 346 square miles, and a population thereon of 82 persons to the square mile. On Abrams Creek, a small tributary near its source, is located Winchester, Va., a thriving city, with a population of 5,864. Winchester has a public water supply derived from Rouses Spring, southeast of the town. The average daily consumption is about 1,000,000 gallons. A plant for treating the water with liquid chlorine is soon to be installed. The entire town is served by a sewerage system, which also receives the liquid wastes from the Lewis Jones Knitting Co. and the Virginia Woolen mill. The sewage is carried to a point below the water pumping station and there treated in a sewage-disposal plant which consists of a screen chamber, a dosing tank, four sand filters, and a sludge bed. (Fig. 5.) The filters are run in pairs and are scraped once a week. The sewage is very highly colored by the woolen-mill wastes, which also contain large amounts of lint. This latter material has a tendency to clog the surface of the beds. The sludge bed is used for drying the material that collects in the screen chamber. The effluent which discharges into a branch of Abrams Creek seems to be of good quality, judging by its appearance and by the absence of putrefaction in the stream below the plant.

Below Winchester there is no more direct pollution until the city of Martinsburg, W. Va., is reached. This town, located on Tuscarora Creek, about 2 miles above where it joins the Opequon, is a progressive, growing community, with a population of 10,698. There is a municipally owned public water supply, derived from springs about a mile south of the town. This supply had been considered entirely safe from a sanitary standpoint until early in 1914, when officers of the United States Public Health Service who were making an intensive study of sanitary conditions in Berkeley County found, on inspection, that the springs were exposed to the direct drainage from a barn and an open insanitary privy, and that the water contained *B. coli.* The barn was immediately moved and the privy converted into one of sanitary type. At the request of the city authorities, Sanitary Engineer Letton of the service was called in, and at his suggestion a temporary plant was installed for disinfecting the water with calcium hypochlorite. Since that time the water delivered to the town has been free from pollution. It is planned shortly to replace the temporary plant by a permanent one. The average daily consumption is about 1,430,000 gallons.

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There is no sewerage system in Martinsburg, but it is intended to vote upon the subject of constructing one in the near future. Tuscarora Creek flows through the town and receives the flow from numerous springs which issue from the limestone. A deep ravine leads north from the creek. In the bottom of this ravine a circular concrete sewer has been constructed for a considerable distance, for the purpose of carrying off storm water and the wastes from two knitting mills, but there are undoubtedly many sewer connections along its entire length. At the head of the ravine is located the Interwoven Knitting mill. The waste from this mill, consisting of spent dye and wash water to the amount of about 25,000 gallons daily, is discharged into a tank having a capacity of 18,000 gallons. From this tank the liquid enters the above-mentioned sewer. The sewage of the employees is discharged into a cesspool. A little farther down the ravine is the mill of the Crawford Woolen Co. This company, which has about 300 employees, discharges its spent dyes and wash water directly into the sewer. The sewage of the employees goes into a large cesspool. The discharge from the sewer has an offensive appearance and odor and gives to Tuscarora Creek a high color, which persists until after it has commingled with the waters of Opequon Creek. The Hannis distillery is located some distance above the point where the sewer discharges into Tuscarora. At this point has been discharged the water separated from the spent mash. This waste has caused nuisances in the past, but since July 1, 1914, the manufacture of whisky has been prohibited by statute in the State of West Virginia. Typhoid fever has been prevalent in Martinsburg for years. This is probably due to the fact that insanitary privies and cesspools have been used almost without exception. Public sentiment, however, has been aroused and it is hoped that conditions will be improved. No direct pollution enters Opequon below Martinsburg.

POTOMAC RIVER FROM OPEQUON CREEK TO ANTIETAM CREEK.

About 20 miles below the mouth of Opequon Creek is the town of Shepherdstown, W. Va., with a population of 1,070. The town has neither water supply nor sewerage systems, the inhabitants depending upon wells and privies, of which the latter contribute more or less indirect pollution to the river. Five miles below Shepherdstown Antietam Creek enters the Potomac from the north. This stream, which rises in the South Mountain in Franklin County, Pa., drains a watershed of 289 square miles, with a population of 145.8 persons to the square mile. The first town of importance is Waynesboro, Pa., a rapidly growing community with a population of 7,198. The town has a public water supply derived from a small stream on the

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mountain 6 miles east of Waynesboro. The average daily consumption is about 1,300,000 gallons. There is no sewerage system in the town for the following reason: The entire place is underlaid by a limestone formation containing numerous fissures, to which a majority of the buildings in the town are connected. There are a number of large machine factories in Waynesboro, and these discharge the sewage of their hundreds of employees into fissures in the rock. While such practice is a convenient one for this community, it undoubtedly has insanitary effect upon the wells and springs of the country for some distance below Waynesboro. About a mile southeast of Waynesboro Red Run joins the east branch of Antietam Creek. Red Run receives the indirect drainage from Rouzesville, Pa., and from the summer-resort district in which are located Pen Mar, Buena Vista Springs, Cascade, Highfield, and parts of Blue Ridge Summit, Monterey, and Charmian. These latter places are partially served by public water supplies. Cesspools and privies, however, are the only methods used for the disposal of sewage. Rouzesville has a public water supply derived from a small stream on the near-by mountain. It has no sewerage system, but depends on cesspools and crevices in the limestone.

The next point where pollution occurs is at Hagerstown, Md. This is the third largest city in Maryland, and in the Potomac River watershed. Its population was 16,507 in 1910, and it is growing at the rate of about 300 per year. It has a public water supply furnished by the Washington County Water Co. The supply is derived from an impounded stream in Warners Gap Hollow on South Mountain, about 11 miles east of the city. The average daily consumption is about 2,500,000 gallons. The water is treated at the reservoir with calcium hypochlorite. In years of low rainfall this supply does not furnish enough water to meet the demand, such a condition having occurred three times in the last five years. In order always to furnish enough water, the company has built a rapid sand filtration plant on Antietam Creek, 2 miles east of town. This plant has a capacity of 4,500,000 gallons daily. The water is coagulated with sulphate of aluminum, settled, filtered, and then treated with calcium hypochlorite. There is no domestic sewerage system in Hagerstown. A small run which bisects the town has been covered for a considerable distance and acts as a storm sewer. To this run have been connected, unlawfully, a great number of domestic sewers from buildings along its course, and into it are also discharged the wastes from the following establishments: Condenser water and water used in washing kegs from the Hagerstown brewery; about 70,000 gallons daily of dilute bleach and soda-ash solutions from the J. C. Roulette & Sons Co. (this waste undoubtedly has a beneficial

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effect on the stream, as the odor of bleach was quite noticeable at the outlet of the sewer); about 10,000 gallons of spent-dye liquor per day from the Blue Ridge Knitting Co. About 1 mile up Antietam Creek from the filter plant of the water company is the mill of the Antietam Paper Co. This company, which makes paper from old newspapers by the soda process, discharges about 100,000 gallons per day of dirty water containing a small amount of bleach and soda ash.

The only other towns of importance on this stream are Sharpsburg, Md., and Keedysville, Md., having a population, respectively, of 960 and 367. Neither town has a water supply or sewerage system. Sharpsburg is the station for visitors to the Antietam battle field and is of importance because of their large number.

The sanitary survey of the basin up to this point has given evidence of continuous, and in places concentrated, pollution of the river, but when the great dilution is considered it was not anticipated that this pollution would prove to be extreme. The following bacteriological findings confirm this conception (Table 3). The presence of *B. coli* in a majority of 1 c. c. samples and in an occasional 0.1 c. c. sample closely corresponds to the conditions found at the inlet of the Washington water supply, which is interpreted as excluding any considerable introduction of pollution between Harpers Ferry and Great Falls. Water polluted to this extent, while of course unfit for domestic use without preliminary treatment, nevertheless furnishes an acceptable supply when such treatment is adequately applied.

TABLE 3.—*The results of bacteriological examination of water in the vicinity of Harpers Ferry, Md., May, 1914.*

Place and date.	Sample No.	Bacteria per c. c.		*B. coli* in broth.			
		Agar.	Gelatin.	10 c. c.	1 c. c.	0.1 c. c.	0.01 c. c.
West Virginia side of bridge: May 5, 1914	1	10,000	20,000	.....	+	.....	.....
Canal at Harpers Ferry: May 5, 1914	2	4,800	13,000	.....	.....	+	.....
Maryland side of bridge: May 5, 1914	3	500	3,800	+	.....	.....	.....
Shenandoah, West Virginia end of bridge: May 5, 1914	4	1,600	1,800	.....	+	.....	.....
Shenandoah, above Harpers Ferry, West Virginia side: May 5, 1914	5	900	1,500	.....	+	.....	.....
Shenandoah at Harpers Ferry, Virginia side of bridge: May 5, 1914	6	5,300	5,500	.....	+	.....	.....
Shenandoah at Harpers Ferry, Virginia side of bridge: May 6, 1914	7	2,500	4,800	.....	+	.....	.....
Shenandoah at Harpers Ferry, middle of bridge: May 6, 1914	8	3,300	4,000	.....	+	.....	.....
Shenandoah at Harpers Ferry, West Virginia side of bridge: May 6, 1914	9	5,500	6,800	.....	+	.....	.....
Shenandoah above Harpers Ferry, West Virginia side: May 6, 1914	10	1,400	2,300	.....	+	.....	.....

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TABLE 3.—*The results of bacteriological examination of water in the vicinity of Harpers Ferry, Md., May, 1914*—Continued.

Place and date.	Sample No.	Pacteria per c. c.		*B. coli* in broth.			
		Agar.	Gelatin.	10 c. c.	1 c. c.	0.1 c. c.	0.01 c. c.
Canal at Harpers Ferry: May 6, 1914	11	5,000	6,800	.....	.....	+	.....
Potomac, Maryland side of bridge: May 6, 1914	12	6,500	11,000	.....	.....	+	.....
Potomac, Maryland side of bridge at middle: May 6, 1914	13	1,300	5,700	.....	.....	+	.....
Potomac, West Virginia side of middle of bridge: May 6, 1914	14	1,100	2,000	.....	.....	+	.....
Potomac, Virginia side of bridge: May 6, 1914	15	2,000	3,800	.....	+	.....	.....
Between Cumberland and Harpers Ferry.							
Potomac above South Branch: May 4, 1914	Q	1,000	6,400	.....	+	.....	.....
Potomac South Branch above North Branch: May 4, 1914	R	1,000	4,700	.....	.....	+	.....
Little Cacapon: May 4, 1914	S	375	5,000	+	.....	.....	.....
Potomac above Magnolia: May 4, 1914	T	1,000	4,300	+	.....	.....	.....
Potomac at new bridge, Magnolia: May 4, 1914	U	1,400	9,300	+	.....	.....	.....
Potomac at Western Maryland Ry. bridge below Magnolia: May 4, 1914	V	7,800	9,100	.....	.....	+	.....
Well supplying Bennet & Talbot construction camp: May 4, 1914	W	3	20	−	.....	.....	.....
Well supplying H. S. Kerbaugh construction camp: May 4, 1914	X	5	80	−	.....	.....	.....

CHESAPEAKE & OHIO CANAL.

The following quotation is from The Potomac River Basin, Department of the Interior, United States Geological Survey, 1907:

The Chesapeake & Ohio Canal, which commences at Cumberland, lies on the Maryland side of the Potomac and pursues the immediate valley of the river to a point 1 mile below Pawpaw, where it passes through a spur of Town Hill by means of a tunnel 3,636 feet long and of circular cross section 27 feet across. This tunnel saves about 6 miles. The total rise, from the level of midtide at Georgetown to the Cumberland Basin, is 609.7 feet. This ascent is broken by 74 lift locks and a tide lock that connects Rock Creek Basin with the Potomac. The canal has a depth of 6 feet throughout, and from Georgetown to Harpers Ferry, 60 miles, it is 65 feet wide at the surface and 41 feet at the bottom. From Harpers Ferry to Dam No. 6, 47 miles, the width at the surface is 60 feet and at bottom 36 feet. From Dam No. 6 to Cumberland, 50 miles, the surface width is 55 feet and the bottom width 31 feet. The average lift of the locks is a little in excess of 8 feet, though there are thirteen 10-foot locks and four 6-foot locks. The locks are 100 feet long and 15 feet in the clear, and pass boats carrying 122 tons of 2,240 pounds. The canal is fed with water at eight different points. The first is at the Beal mill race, in Cumberland, which is connected by gates with Wills Creek at the dam near the tannery of the United States Leather Co.

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The enormous amount of sewage which this race receives is to a large extent deposited as sludge in the head basin of the canal. This action is probably facilitated by the nature of the water received at the second supply point, the head gates of the canal. This water is, as a rule, largely from Wills Creek, mixed with considerable water from North Branch, though in times of low water the entire flow of both North Branch above Dam No. 7 and Wills Creek goes down the canal.

The Wills Creek water is heavily polluted by mine waters, and therefore contains considerable quantities of iron and sulphuric acid, which are precipitating elements, as is the lime of North Branch. So great is the accumulation of precipitated sewage in the head basin that the canal company finds it necessary to dredge it out every other spring. When this is done, the sludge is distributed over the towpath and river side of the embankment. It becomes very hard and most of it remains in place, though some of it is carried off by the river. In the winter, after the water is drawn off from the canal, the contents of the race discharge into the head basin as usual, but instead of continuing down the canal, as when the canal is in use, they return to the river near the foot of the basin and below Dam No. 7. This first supply is not properly a part of the works of the canal. The precipitating action continues for 51 miles down the canal to the third supply point, Dam No. 6, where the water in the canal is said to be much clearer than at Cumberland.

Dam No. 6, below Greenspring, admits river water, which to a large extent comes from South Branch, and hence is usually of better quality than the river water at Cumberland, and by dilution greatly improves the water in the canal. From Dam No. 6 to Dam No. 5 the distance is 29 miles. About 6 miles above Dam No. 5 the canal passes through what are known as Little and Big Pools. These were originally high-water channels of the river, which have been incorporated into the canal. Big Pool is 2 miles long. The occurrence of these pools is noted, because the current through them must necessarily be very small, and so gives opportunity for sedimentation of material suspended in the canal water, and also because they must add to the time it takes the water to complete its passage through the canal from Cumberland to the river. The canal and the river unite half a mile above Dam No. 5, and in the half-mile stretch above the dam the canal and river waters are thoroughly mixed. At Dam No. 5 the canal resumes its separate course, and a fourth point of water supply is established.

From Dam No. 5 to Dam No. 4, the fifth point where water is received by the canal, the distance is 21½ miles. About 4½ miles above Dam No. 4 the canal reenters the river, and continues united with it for 3.3 miles, to a point 6,000 feet above the dam. In this distance the waters of the canal and river have become thoroughly mixed, and it is well to remember that this dam is but 67½ miles above Great Falls. From Dam No. 4 the canal continues 23 miles to Dam No. 3, at Harpers Ferry, the sixth point of water supply. Dam No. 2, half a mile east of Seneca Falls and 40 miles below Harpers Ferry, is the seventh and last point of water supply until Dam No. 1 is reached at Little Falls.

Throughout its length the canal is built on the surface of the land, and so receives little ground water; in fact, the water has a tendency to seep out through the canal banks and, in places, to make the farm lands too wet to be successfully cultivated. The current in the canal is very variable, changing in its different sections and with the stage of the river. Perhaps it would be correct to assume a current of 1 mile an hour in normal sections. At times of flood portions of the canal are under water.

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Two expensive aqueducts carry the canal over Conococheague Creek and Monocacy River. The myriad little runs that come down from the hillsides to the river are excluded from the canal by means of passages made for them beneath the canal through masonry culverts. Thus these streams find direct entrance to the Potomac, except three, which enter Big Pool, and a few dry runs, the most important of which are one a little east of Monocacy River, one just above Harpers Ferry, and one 2 miles below Dam No. 6.

Every winter the water is drained off from the canal and its service discontinued. The length of the canal season is usually eight to nine months, and repairs are made every spring before the canal is reopened. It is not found necessary to clean out the canal on account of suspended matter deposited during the season's use, but certain points on the canal need rather frequent dredging because of earthy materials that is brought in over its banks by water flowing over cultivated ground and in other ways. The canal company has no sanitary regulations, and the crews of canal boats use the canal as a receptacle for feces and for kitchen offal. A few of the privies of the lock keepers overhang the canal, but the feces do not get into the river except in times of freshet. The canal company has succeeded in abolishing all but two or three of the other privies which overhang its line, and these, it is expected, will soon be removed. During the season of 1905 but one man employed on the canal boats was known by the officials of the company to have suffered from typhoid fever.

The canal has changed but little, and the above accurate description is therefore applicable at this time as a general survey of conditions. There have, however, been changes near Cumberland which affect the canal. The completion of the tunnel which drains the extensive mines around Eckhart has increased enormously the acid wastes in Wills Creek, from which is derived almost all of the water which flows into the head basin of the canal, and as a result of this the sedimentation has been greatly increased. The change in chemicals used at the paper mills at Luke may also contribute to increased sedimentation. Because of the important action upon the sewage of Cumberland, this basin is a valuable asset in the purification of the river, but below this point the effect of the canal upon the character of the river is slight. The amount of pollution received is small, the total flow is small, and the canal is merged with the river at several points.

POTOMAC RIVER FROM ANTIETAM CREEK TO SHENANDOAH RIVER.

Elk Branch, a small stream which receives the indirect pollution of Shenandoah Junction, enters the Potomac a mile above Harpers Ferry. Five miles below the mouth of Antietam Creek the Shenandoah River joins the Potomac. On the neck of land between these is located Harpers Ferry, W. Va., a town which has a population of 766. There is no public water supply in Harpers Ferry, the inhabitants depending on private wells for water. The Hilltop Hotel has a water supply from a deep well, and discharges its sewage over a bluff, where it ultimately is washed into the Potomac. The Balti-

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more & Ohio station has a sewer discharging into the Potomac beneath the bridge. Two mills which manufacture wood pulp are located in Harpers Ferry—one on the Potomac and one on the Shenandoah. The pulp is made by the mechanical or grinding process and all the waste material is burned.

SHENANDOAH RIVER.

South Fork.—The Shenandoah is the largest tributary of the Potomac, its watershed embracing an area of 3,058 square miles and supporting a population of 43.7 persons to the square mile. The Shenandoah River is formed at Riverton, Va., by the confluence of the North Fork and South Fork. The South Fork is in turn formed by the confluence of the North River, Middle River, and South River near Port Republic, Va.

South River rises in Augusta County, Va., and flows northeast. The first points of pollution are at the towns of Basic City, Va., and Waynesboro, Va., located opposite each other on the east and the west banks of the river, and having populations of 1,623 and 1,389, respectively. Basic City has a public water supply obtained from the Basic City Lithia Spring. The water from the spring flows by gravity to a pumping station, where it is forced to a reservoir on the hill above the town. The average daily consumption is about 200,000 gallons. A system of sewers to serve about 50 per cent of the population is being constructed. At the present time a few private sewers discharge into the river. Two plants for obtaining tanning extract from chestnut wood are located in Basic. The condenser water from these plants, which contains a small amount of extract, is discharged directly into the river.

Waynesboro has a public water supply derived from Baker Spring, just south of the town. There is no public sewerage system, but about three-fourths of the town is served by private sewers, which discharge directly into the river.

Below Basic, the only point of importance on the South River, is Grottoes, Va. At this point is located the celebrated Weyer's Cave, which annually attracts thousands of visitors. The town has neither water-supply nor sewerage systems. There is a large summer camp on the river near the cave, which undoubtedly contributes a certain amount of indirect pollution.

Middle River, which joins North River near Port Republic, rises in the mountains south and west of Staunton, Va., the tributaries and main river joining in a branching, tree-shaped figure. The only important place on this stream is Staunton, Va., a rapidly growing town having a population of 10,604. A public water supply owned by the municipality is derived from a number of springs located just west of the town. The average daily consumption is about

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1,300,000 gallons. About 50 per cent of the town is served by a "separate system" of sewers, which discharge at various points into Lewis Creek, a small stream that flows through the city. Through the central part of the town the stream is arched over, but this is discontinued at a point near the Baltimore & Ohio Railroad station. At this point the stream is simply an open sewer, which has an offensive appearance and gives off unpleasant odors.

The following schools are located in Staunton, and during the school year the population is increased accordingly: Staunton Military Academy, 450 students; Mary Baldwin Seminary, 350 students; Stuart Hall, 200 students; Business College, 200 students; and the Virginia School for the Deaf and Blind with 250 students. All of the above institutions, with the exception of the last, are supplied with water from the town supply and connected with the public sewerage system. The school for the deaf and blind has a connection with the public water supply for fire protection, but water for domestic purposes is obtained from a private supply, derived from a spring which yields about 30,000 gallons per day. The sewage from the school is discharged into Lewis Creek. Another State institution, the Western State Hospital, with about 1,500 patients and attendants, is located in Staunton. Its water supply of about 125,000 gallons daily is obtained from the town supply. The sewage from the institution is discharged into a small tributary of Lewis Creek which flows through the grounds. Inasmuch as the grounds are used as a park in which the patients exercise, it would seem much better to carry the sewage through a pipe line directly into Lewis Creek.

North River rises in the northwest corner of Augusta County, Va., and flows in a general northeasterly direction, its tributaries as a rule entering from the north. The upper part of the watershed being rough and mountainous is given over almost wholly to lumbering. The first pollution of note is at Bridgewater, a town with a population of 859. A municipally owned public water supply and a complete sanitary sewerage system have just been installed at this point. The water supply is derived from springs west of the town. The consumption is small at the present time, but connections are rapidly being made and more water is being used every day. The sewers discharge directly into North River about 1,000 feet below the town.

About 4 miles below Bridgewater, Cooks Creek enters from the north. This stream receives the flow of Blacks Run, a small tributary which rises near Harrisonburg, Va., and receives the drainage therefrom.

Harrisonburg, with a population of 4,879, has a municipally owned water supply derived from Dry River, about 13 miles west of the

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town. The average daily consumption is about 600,000 gallons. The town is almost completely sewered and the sewage is carried through a line of pipe to a point about 2 miles south of the town, where it is discharged into Blacks Run.

The tannery of the J. P. Houck Tanning Co. is located in Harrisonburg. This establishment uses about 100,000 gallons of water a day, obtained from the old "town spring." The waste liquid, consisting of spent-tan liquor, soak liquor, wash water, and limewater, is discharged into the town sewer. When the sewer was extended to the creek it was intended to construct a complete sewage-disposal plant, as it was evident that there was insufficient flow in Blacks Run to care for the sewage without causing a nuisance. The project was held up by property owners in the vicinity of the proposed plant, and the sewage has been discharged directly into the creek. This has caused a great deal of trouble. The tannery waste gives the sewage a dark color, and at the point of discharge a pool has been formed, which is covered with scum and is actively septic. (Fig. 6.) The odor from the stream where the valley pike crosses it is very disagreeable. It is evident that this condition should not be allowed to continue.

South Fork below Port Republic.—The first important point on the South Fork below Port Republic is Elkton, Va., which has a population of 873. A public water supply, owned by the Elkton Lithia Spring Water Co., is derived from the Elkton Lithia Spring, about a mile east of town. About 900 persons are supplied with the water. A sewer, serving about 15 houses, discharges directly into the river, as does a private sewer from the Elkton Hotel. A tannery, owned by J. R. Cover & Sons, is located in Elkton on Elk Run, a small stream flowing through the town. About 112 hides are being handled daily, but it is intended to increase this number next year to 165. The wastes, consisting of spent-tan liquor, soak water, wash water, and limewater, to the amount of about 30,000 gallons, to which is added several times this amount of condensed water a day, are discharged into Elk Run. The creek, clear and sparkling above the tannery, is converted into a black, greasy, foul-smelling run by these wastes, and as it flows through the center of the town it presents an extremely unpleasant appearance, to say the least.

The next point of pollution is the town of Shenandoah, with a population of 1,431, located about 6 miles north of Elkton. Shenandoah has a public water supply, derived from the South Fork, serving about 1,600 persons. The water is not treated in any way, and is said to be always turbid following rains, besides being colored by the tannery effluent at Elkton. This is a condition which should not be allowed to continue. While it is stated that typhoid fever is not

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now unduly prevalent in Shenandoah, the town is undoubtedly subject to the potential danger of a serious outbreak of typhoid fever at any time.

Sixteen miles below Shenandoah is Luray, Va., with a population of 1,218. A municipal water supply derived from two small streams on the mountain east of the town is in operation. It is said that about 2,500 persons are supplied with the water. There is no public sewerage system, but about 500 persons are served by private sewers discharging into Hawkesbill Creek, which divides the town into two parts. This stream also receives the wastes from two tomato canneries and from the tannery of the Deford Co. At this factory 254 large hides, about 84 per cent of the capacity of the plant, are tanned daily. The wastes, which consist of soak liquor, limewater, wash water, and spent tan liquor, to the amount of 150,000 gallons daily, are distributed into either one of two ponds, 100 feet in diameter by 3½ feet deep and 62 feet in diameter by 2½ feet deep, respectively. The effluent from the ponds is discharged directly into the creek. The sediment which accumulates in the ponds is periodically removed and used as a fertilizer. For about 2 miles below this tannery the creek presents a very unsightly appearance, due to accumulations of sediment along its course. The discoloration persists from this point to the junction of Hawkesbill Creek with the Shenandoah. This tannery has been selected by the service for experimental studies of methods of disposal of wastes of this character.

North Fork of the Shenandoah River.—The North Fork rises in West Virginia just across the State line from the northeast corner of Rockingham County, Va. It flows in a southeasterly direction to a point near Broadway, Va., where it turns and flows northeast to Strausburg, at which place it again turns southeast to its junction with the South Fork at Riverton, Va.

The first town causing pollution is Mount Jackson, Va., which has a population of 479. There is a municipally owned public water supply at this point derived by gravity from springs on Massanutten Mountain, east of the town, by which about 400 persons are supplied. The entire town is sewered, the sewage being discharged into the river and a small creek through four outlets.

Eight miles below Mount Jackson is the town of Edinburg, with a population of 574. A public water supply is derived by gravity from springs 4 miles east of the town. About 50,000 gallons are used daily, of which quantity the Southern Railroad Co. takes 35,000 gallons. In times of drought the railroad is supplied with water pumped from Stony Creek. There is no public sewerage system, but about 100 persons are served by private sewers which discharge into Stony Creek.

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Six miles below Edinburg is the town of Woodstock, Va., with a population of 1,314. There is a municipally owned water supply derived by gravity from springs on Massanutten Mountain. The town has no sewers, cesspools and privies being depended upon for sewage disposal. The creamery of the Chapin-Sacks Co. is located in Woodstock on a small creek, into which it discharges a large amount of condensed water, some milk, and wash water.

The next point to be noted is Strasburg, Va., with a population of 769. The town has a public water supply, derived from a stream on Massanutten Mountain, which supplies about 1,200 persons. There is no public sewerage system, although about 30 houses have private sewers which discharge into small tributaries of the river.

No more direct pollution reaches the river before its junction with the South Fork. Between the two streams is Riverton, Va., a small town which obtains its water supply of about 100,000 gallons a day from Front Royal, Va.

Just below Riverton, Happy Creek enters the Shenandoah River from the south. On the creek a short distance from its mouth is the town of Front Royal, Va., with a population of 1,133. There is a municipally owned water supply at this point derived from Happy Run, near Chester Gap. The average daily consumption of water is about 400,000 gallons, which supplies about 3,000 persons. About a year ago Front Royal had an epidemic of typhoid fever, the source of which was traced to the water supply, following which the character of the supply was materially improved. A number of the L. R. S. type of sanitary privies were installed along the roads leading through the watershed, and a modern rapid sand filtration plant was constructed. (Fig. 7.) The water, after filtration, is treated with calcium hypochlorite.

A considerable portion of the watershed is embraced in the grounds of the Front Royal remount depot of the United States Army. The station buildings have a water supply derived from springs. The sewage is to be treated in septic tanks and sprinkling filters, and the effluent discharged into Happy Run, just below the reservoir of the Front Royal water supply. Sanitary privies have been constructed at numerous points throughout the reservation. There is no public sewerage system in Front Royal, but the installation of one is under consideration. A few private sewers discharge into the creek, as does the effluent from three septic tanks in which the sewage of the Randolph-Macon Academy is treated. This school has about 200 students who use daily about 9,000 gallons of water obtained from the town supply.

The next town of importance is Berryville, Va., with a population of 876. This town, located on Lewis Creek about 4 miles from its mouth, has a public water supply derived from mountain streams

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east of the Shenandoah River. There is no sewage system, the inhabitants depending on cesspools and privies to receive the wastes.

Below Berryville there is no more direct pollution until Evitts Run enters the river. On this small stream is Charles Town, W. Va., with a population of 2,662. A public water supply, owned by the Charles Town Water Co., is derived from a covered spring near Evitts Run. The average daily consumption is about 400,000 gallons. In the summer months, during the period of low rainfall, it is customary to use some surface water to augment the supply. This surface water and the spring itself are liable at any time to pollution of a dangerous character. At the request of the health officer of Charles Town the writer made an inspection of the supply and discused it before the town council. A representative of the water company was present at the meeting and agreed to install immediately a plant for treating the water with calcium hypochlorite. There is no sewerage system in Charles Town, the inhabitants using privies and cesspools.

Four miles below Charles Town, on Flowing Run, is Halltown, Va. At this place is a large paper mill making cardboard from old paper. The only waste from this plant consists of dirty water used in washing the paper. This is the last point of pollution above the mouth of the river at Harpers Ferry.

POTOMAC RIVER BELOW THE SHENANDOAH RIVER.

About 4 miles below Harpers Ferry is the town of Weverton, Md., and about a mile below it is Knoxville. These are both small places and contribute only indirect pollution to the river. At Weverton is the Savage Distillery, a small plant. The spent mash is piped into a wooden tank, from which it is sold to farmers for feed; a certain amount, however, spills on the ground and finds its way into the river.

A few miles below Knoxville is Brunswick, Md., a town having a population of 3,721. At this point are located the shop and transfer yards of the Baltimore & Ohio Railroad. There is a public water supply derived from a deep well, about 60,000 gallons being used daily. A few houses and the Baltimore & Ohio buildings are supplied with raw Potomac River water, which is pumped by the railroad company. There is no sewerage system in Brunswick, but a great many people have private lines leading to one of the four ravines which traverse the town. Sewers from the office buildings of the railroad company, the Y. M. C. A., and the shops also discharge into these runs. The town is built on the side of a steep hill, and during rains the pollution must be washed quickly into the Potomac, thus constituting direct pollution.

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About 5 miles below Brunswick, Catoctin Creek enters from the north. This stream has a watershed of 112 square miles and a population of 58.4 persons to the square mile. The first town of importance is Middletown, Md., with a population of 692. There is a municipally owned public water supply at this point derived from a spring on a near-by mountain. There is no public sewerage system, but a number of houses have sewers which empty into the town run.

The next point of importance is Burkittsville, Md., having a population of 228. The town is located on Middle Creek, a branch of Broad Run, which joins the Catoctin 5 miles above its mouth. A public water supply owned by the Burkittsville Water Co. is derived from a spring on South Mountain, from which about 50 persons are supplied with water. The distillery of the Horsey Outerbridge Co. is located at this point. About 6,000 gallons of water from the spent mash are discharged daily during the winter months into Middle Creek.

Five miles below the mouth of Cacoctin Creek are the small towns of Point of Rocks and Washington Junction, Md., which contribute only in direct pollution to the river. About 6 miles below these towns the Monocacy River enters the Potomac River from the north.

MONOCACY RIVER.

Rock Creek, Pa.—The Monocacy River has a watershed of 962 square miles, on which there live 77.9 persons to the square mile. It rises in Adams County, Pa., in three branches—Rock, Marsh, and Toms Creek. Near the source of Rock Creek is Gettysburg, Pa., with a permanent population of 4,030. The Gettysburg battle field, which has been made into a national park, attracts thousands of visitors annually, so at times the population is considerably augmented. The town has a privately owned public water supply, derived from Marsh Run, about 4 miles to the southeast. At this point there is a rapid sand filtration plant, having a capacity of 1,000,000 gallons per diem. The water, after filtration, is treated with calcium hypochlorite. The average daily consumption is about 400,000 gallons. The town is completely sewered by a system of sanitary sewers. The sewage is discharged into a small septic tank and the effluent from this enters Stephens Run, a small creek, about 200 yards above its junction with Rock Creek.

During the reunion encampment in 1913 the State health department installed a plant for treating the sewage effluent with calcium hypochlorite. After the encampment the plant was given to the city. It was not in operation, however, at the time of inspection. Below the point of sewage discharge, Jennings Run is an open sewer in a foul condition. The evidence of the sewage in Rock Creek below Jennings Run is also very striking.

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From below Gettysburg to the place where Rock Creek joins Marsh Creek to form the Monocacy there is no direct pollution. The only probable points of pollution on Marsh Creek are at McKnightstown, Pa., where there is a small tannery, at present not in operation, and at Ortanna, Pa., where a large apple cannery is located, from which there may be some waste in the canning season.

Toms Creek.—Near the headwaters of Toms Creek is located the Maryland Tuberculosis Sanitorium, with a population of about 550. The institution has a water supply derived from a covered spring and from six wells. The sewage from the buildings is discharged into a large septic tank, and the effluent from this runs into a series of underground tiles. The system gives great satisfaction, the sewage being kept out of sight during the entire process of disposal. At times the effluent from the septic tank is run on the surface of the ground and used to irrigate crops which are grown on the land in which the tile is laid.

Farther down Toms Creek is the town of Emmitsburg, Md., with a population of 1,054. There is a privately owned public water supply derived from Turkey Creek near its source. About 1,000 persons in the town and 600 in St. Joseph's Academy are supplied. There is no public sewerage system in Emmitsburg, but a number of private sewers discharge into Flat Run, a small stream east of the town.

St. Joseph's Academy, also the location of the Mother's House of the Sisters of Charity of the United States, has a private sewer discharging into Toms Creek. Two miles southwest of this point is located St. Mary's College, a school for boys. This institution has a water supply derived from a spring and a system of sewers which discharge into a small tributary of Toms Creek. There are about 300 students at the school during the school session.

Piney Creek.—About 2 miles above the mouth of Toms Creek Piney Creek enters from the east. This stream rises near Littlestown, Pa., a town with a population of 1,347. There is a municipally owned public water supply at this point derived from two deep wells east of town. There are about 850 persons supplied with the water, the average daily consumption being 95,000 gallons. There is no sewerage system in Littlestown, privies and cesspools being used for the disposal of wastes.

Eight miles below is Taneytown, Md., with a population of 842. A municipal water supply is derived from drilled wells. The average daily consumption is about 40,000 gallons. A private sewer from the hotel empties into a small branch of Piney Creek, while the remainder of the town is served by privies and cesspools.

Double Pipe Creek.—About 6 miles below the mouth of Toms Creek Double Pipe Creek enters from the east. This stream is

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formed 2 miles from its mouth by the confluence of Little Pipe Creek and Big Pipe Creek. There is no important pollution on the latter stream.

Little Pipe Creek rises near Westminster, Md., a town located on the Potomac watershed divide, with a population of 3,295. A public water supply, owned by the Consolidated Public Utilities Co., is derived from springs and wells. The average daily consumption is about 280,000 gallons. There are no sewers in Westminster, the wastes being disposed of in privies and cesspools.

Eight miles below Westminster is the town of New Windsor, which has a population of 446. A municipal public water supply is derived from springs 3 miles south of the town. There are no sewers.

Five miles below is Union Bridge, Md., with a population of 804. A municipally owned public water supply is derived from deep wells. The average daily consumption is about 140,000 gallons. One of the wells having shown contamination, a plant was recently installed for treating all water with chlorine gas. There are no sewers in Union Bridge, cesspools being the common method of sewage disposal.

Hunting Creek.—About 8 miles below the mouth of Double Pipe Creek Hunting Creek enters from the west. On this stream is located Thurmont, Md., with a population of 903. A public water supply, owned by the Mechanicstown Water Co., is derived from High Run, a small branch of Hunting Creek. There are no sewers in Thurmont.

Walkersville.—Below Thurmont, on Glade Creek, a small tributary, is Walkersville, Md., having a population of 582. The Walkersville Water Co., which derives its supply from springs near the head of Gape Creek, furnishes water to the town, supplying about 450 persons. There is no sewerage system in Walkersville, the inhabitants using privies and cesspools for the disposition of their wastes.

Carroll Creek.—A few miles below the mouth of Glade Creek Carroll Creek enters the Monocacy. On this stream, 2 miles above its mouth, is the town of Frederick, Md., which has a population of 10,411. Frederick has a municipally owned public water supply derived from Tuscarora and Fishing Creeks, northeast of the town. The average daily consumption is about 2,500,000 gallons. The town has no general sewerage system for domestic sewage, but several sewers discharge into Carroll Creek. It is illegal for sewage to be emptied into these streams without being first passed through a septic tank. The tannery of Birely & Sons is located on the bank of Carroll Creek. About 60 hides are tanned weekly. It is alleged that there are no wastes from this establishment, but undoubtedly

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some liquid escapes into the stream. The Union Knitting Mills discharge a large amount of spent bleach and dye liquor, as well as the sewage from their 200 employees, into the creek. The Whtie Cross Milk Co. discharges a certain amount of wash water containing some milk. The Monocacy Valley Co. during the canning season has a small amount of waste, consisting mostly of wash water from peas and corn.

Two miles above Frederick is the Monte View Hospital and Almshouse, with 200 inhabitants, for which water is obtained from the Frederick supply. The sewage is passed through a septic tank and then discharged into Carroll Creek. This stream below the city presents a very disagreeable aspect, being nothing less than an open septic sewer. No appreciable pollution reaches the Monocacy below Frederick.

Braddock Heights.—About 5 miles west of Frederick, on the divide between Monocacy and Catoctin Creek, is Braddock Heights. This community is a popular summer resort, practically deserted during the winter months, but having a population of about 1,200 persons during the summer months. There is a public water supply, which is secured from a covered spring about 1 mile east of town. The consumption of water is negligible during winter, but approximates 35,000 gallons daily during the summer. Cesspools and ordinary privies are used for the disposal of sewage.

AREA SURROUNDING DISTRICT OF COLUMBIA.

Goose Neck Creek.—Goose Neck Creek enters the Potomac from the south 15 miles below the mouth of the Monocacy River. This stream has a watershed of 384 square miles, with a population thereon of 41.4 persons to the square mile. It rises in the Blue Ridge Mountains and flows in a northeast direction to the Potomac. On the North Fork of Goose Neck is the town of Round Hill, with a population of 379. There is a water supply at this point derived from wells, but no sewerage system.

The only other important town in this watershed is Leesburg, Va., which has a population of 1,597. There is a public water supply at this point derived from springs and a well. The town is partly sewered, there being about half a mile of sewers which discharge into Tuscarora Creek, a small branch which enters Goose Neck a few miles above its mouth.

Seneca Creek.—About 8 miles down the Potomac below Goose Neck, Seneca Creek enters from the north. This small stream has a watershed embracing 128 square miles, with a population thereon of 54.2 persons per square mile. There are no towns of any size on the watershed.

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Great Falls.—About 9 miles below the mouth of Seneca Creek are the Great Falls of the Potomac. At this point the river falls very rapidly by a series of rocky rapids. Above the rapids the river is dammed to form the intake for the Washington water supply. Below Great Falls is the District of Columbia, and surrounding this is a considerable suburban district. This suburban area will be discussed according to the various streams which drain it.

Rock Creek, Md. and D. C.—A few miles below the mouth of Little Falls Brook, just below Georgetown, Rock Creek enters the Potomac. This stream has an area of 77 square miles, with a population of 1,200 persons per square mile. The total population on the stream outside of the District of Columbia is about 3,700. The first town of importance on the stream is Rockville, Md., with a population of 1,181. Rockville has a public water supply derived from drilled wells, which furnish about 20,000 gallons per day.

A severe epidemic of typhoid fever which occurred in Rockville in the early part of 1914 was studied by officers of the Public Health Service and the Maryland State Department of Health, who found that one of the wells had become polluted by the wastes from a typhoid-fever patient. This investigation was reported in Public Health Bulletin No. 65. Rockville has recently completed a sewerage system with treatment works consisting of Imhoff tank and contact beds, effluent being discharged into Cabin John Run.

In Kensington there are two semipublic supplies, which furnish a few houses. A bond issue has been authorized for the construction of both water systems and sewerage systems. Kensington has recently completed a sewerage system discharging without treatment directly into Rock Creek.

Garrett Park, Forest Glen, Linden, Woodside, and other small communities, with the exception of Chevy Chase, which derives its supply from wells, have no public water supplies.

A considerable amount of the following information in regard to this district was obtained from a "Report upon collection and disposal of the sewage of those sections of Maryland adjacent to the District of Columbia to the sewage commission of Montgomery and Prince Georges Counties, Md., by Robert B. Morse, chief, bureau of sanitary engineering, Maryland Department of Health."

Little Falls Brook.—The first of these areas is that drained by Little Falls Brook, a small stream which enters the river just above the District line. There is a population of about 1,900 people on this stream, the majority of whom reside in the communities of Chevy Chase, Somerset, Drummond, Friendship Heights, The Hills, Bradley Hills, and Edgewood. Most of these towns are partially served by public water supplies derived from drilled wells. A con-

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siderable portion of the population is served by sewers, the discharge from which finds its way into Little Falls Brook.

The following quotations from the above-mentioned report describe the condition of this stream.

Little Falls Brook is the most badly polluted of any of the streams under consideration. * * * Its condition at certain times of the year, particularly in summer, when the stream flow is small, is almost intolerable. Both bed and banks are coated with filth and small rank organic growths caused by the entrance of sewage. At times it is no better than an open sewer, and where it passes along Rockville Road it is particularly objectionable to the public. * * * The growth of the communities affected will surely be retarded if the discharge of crude sewage into this stream is continued.

The sewage from Chevy Chase is treated in a plant which consists of a septic tank and contact beds. The other communities have no sewerage systems, the inhabitants depending upon privies and cesspools for the disposal of their wastes.

The amount of pollution entering Rock Creek at the present time is not sufficient in amount to cause a nuisance, but undoubtedly, unless conditions are changed, this stream will become badly polluted within a few years.

Anacostia Creek.—Anacostia Creek, which enters the Potomac near the southeastern corner of the District, has a drainage area of 144 square miles, on which there is a population of 509 persons per square mile. The population on Anacostia Creek, outside of the District of Columbia, was 14,773 in 1910. Only two communities on this stream have public water supplies.

Hyattsville has a public water supply derived from driven wells. The communities of Mount Rainier, Brentwood, Silver Springs, and Bladensburg have no public water supplies. Silver Spring is contemplating the construction of a water supply and a sewerage system.

Takoma Park, with a population of 1,242, is supplied with water derived from Sligo Branch and filtered through rapid sand filters. It is almost wholly served by sanitary sewers. The sewage is treated in two disposal plants—one located on Sligo Branch and the other on Takoma Park Branch. At the first point the sewage is treated in intermittent sand filters, and at the second point in septic tanks and subsurface irrigation fields. The disposal plants at Takoma Park are in very bad condition, no attention seemingly being paid to their proper operation.

The following statement from the before-mentioned report shows the condition of the Sligo Branch plant:

At the time of the examination sewage was being permitted to discharge upon one of the beds, but instead of passing through the sand it was flowing through a hole in the center of the bed directly into an underdrain, and thence to the

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stream. At another time even this pretense of treatment was not being made, for sewage was entirely shut off from the beds and was discharging directly into a stream by means of a ditch. The conditions existing at the latter time were almost indescribable.

The other plant was equally bad:

Sewage was flowing through the septic tank and also through the underdrains, and the field was apparently clogged, and, at any rate, was absolutely incapable of performing its functions; the result being that a septic liquid was discharged directly into the small stream.

A complete study of the area surrounding the District of Columbia was made, as heretofore mentioned, with the view to outlining a comprehensive plan for the design of a sanitary sewerage system for the entire district. The population of this district in 1910 was 20,523, and it is estimated that in 1950 the population will have increased to 150,000. From these figures it is clearly seen that the need of such a plan for the future construction of sewerage facilities is absolutely necessary, and it is trusted that the work will be developed along the lines pointed out in the report.

THE DISTRICT OF COLUMBIA.

The District of Columbia is by far the most important area in the whole watershed in so far as pollution of the river is concerned. The District of Columbia had a population of 331,069 in 1910. The population is rapidly increasing and it has been estimated by the United States Corps of Engineers that the District will have a population of 570,000 in 1950. A peculiar fact in regard to this city is that there is practically no manufacturing, the inhabitants for the most part being employed in the various governmental departments.

Water supply.—The District of Columbia has a public water supply derived from the Potomac River at Great Falls, where a dam has been built with its crest at an elevation of 150.5 feet above mean tide at Washington. From Great Falls it flows by gravity through a circular conduit 9 feet in diameter, for about 9 miles, to Dalecarlia reservoir; thence through a conduit of the same size for about 2 miles to Georgetown reservoir; and finally through a tunnel, about 4 miles long, to McMillan Park reservoir. At McMillan Park reservoir it is raised by means of pumps, about 21 feet to the filters. After being filtered the water flows by gravity from the filtered-water reservoir to the mains and pumping station. * * * The filtration plant is of the slow sand type and quite similar to other modern plants of the same kind. There are 29 filters each having an effective filtering area of 1 acre, and a filtered-water reservoir having a capacity of 150,000,000 gallons.

This filter plant is one of the best of its type in the world and it delivers a water that is at all times safe and potable. In times of high turbidity in the river the water entering the Georgetown reservoir is treated with aluminum sulphate, which materially reduces the load upon the filters.

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The following table, from a report on the "Water Supply of the District of Columbia and Water Power at Great Falls,"[1] gives the population and water consumption from 1905 to date, as well as the estimated populations and consumptions to the year 1950.

TABLE 4.—*Water consumption.*

Fiscal year ending June 30—	Population.	Daily consumption.		Average gallons per capita daily.	Per cent of increase of maximum over average.
		Average.	Maximum.		
		Gallons.	*Gallons.*		
1905	323,000	68,700,000			
1906	326,000	67,400,000			
1907	330,000	66,900,000	80,290,000	203	20
1908	339,000	64,910,000	80,380,000	192	24
1909	343,000	61,470,000	78,930,000	179	28
1910	[1] 343,000	59,190,000	78,500,000	173	33
1911	348,000	60,380,000	78,320,000	173	28
1912	354,000	62,120,000	92,720,000	176	49
1915	378,000	[2] 66,000,000	[2] 86,000,000	[3] 173	[3] 30
1920	405,000	[2] 70,000,000	[2] 91,000,000	[3] 173	[3] 30
1930	460,000	[2] 79,000,000	[2] 103,000,000	[3] 173	[3] 30
1940	515,000	[2] 89,000,000	[2] 116,000,000	[3] 173	[3] 30
1950	570,000	[2] 99,000,000	[2] 129,000,000	[3] 173	[3] 30

[1] Since the United States census is consistently lower than the police census, the per capita consumption is based on the latter for 1909—viz, 343,000.
[2] Estimated from probable future population, assuming a per capita consumption of 173 gallons per day and a maximum consumption 30 per cent greater than the average.
[3] Assumed.

Sewerage system.—The sewerage system of the District of Columbia is undoubtedly constructed on one of the most complete and comprehensive plans of any city in the world. In 1889 sewerage conditions had become complicated on account of the sporadic growth of the city. Congress therefore made an appropriation for the employment of a board of sanitary engineers to study the entire problem. This board made its report in 1890, and the plans it proposed have been adopted and are being carried out.

The plan consists, in brief, of collecting all the sewage of the District in interceptors and conveying it to a sewage pumping station on the Anacostia River. Here it passes through a sediment or grit chamber and coarse screens and is then lifted by a series of centrifugal pumps to a receiving well. From this the sewage passes beneath the Anacostia River in two 60-inch iron-pipe inverted siphons and then through a conduit about 3 miles long to the east bank of the Potomac River. From this point it flows through two lines of 60-inch pipe to a point near the center of the channel about 800 feet from shore. The two pipes discharge about 100 feet apart in 30 feet of water.

The sewerage system is built partly on the separate, and partly on the combined, system. There are five pumps for handling the

[1] H. Doc. 1400, 62d Cong., 3d sess.

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domestic sewage. These pumps have a total capacity of 350 cubic feet per second. Practically all of the sewage handled by them passes through the sediment chamber. This is 50 feet wide and 100 feet long and reduces the velocity of the entering sewage to such a point that the heavier particles are deposited. The basin is cleaned by by-passing the sewage and removing the sediment in iron buckets, which are carried on a small industrial railway to a scow into which they are emptied. At the outlet of the sediment chamber are placed the screens. There are made of ¾-inch iron rods spaced 2¼ inches apart. Eight storm-water pumps having a capacity of 100 cubic feet per second each are utilized to lift the storm matter and discharge it directly into Anacostia River. Before reaching the pumps the storm water passes through a screen chamber having screens made of 1½-inch wrought-iron pipe on 4½-inch centers.

In regard to the discharge into the river of domestic sewage not conveyed to the pumping station, the following information was furnished by Mr. Asa E. Phillips, superintendent of sewers:

In the territory extending from one-half mile above to a mile below Chain Bridge there are four sewer outlets which serve a total of 269 houses. Above Aqueduct Bridge and below Three Sisters Islands there are three outlets serving 265 houses. Below Aqueduct Bridge and above Rock Creek are four outlets serving 1,320 houses. It is expected to include in the annual estimates for the next fiscal year the construction of an upper Potomac River interceptor which will remove all sanitary drainage at present discharging into the river west of Rock Creek. Near the foot of New Hampshire Avenue are three outlets receiving the drainage from 45 houses. It was planned to connect these sewers with the existing intercepting system during the year 1914. Five outlets near South Capitol Street and on Ninth, Eleventh, and Twelfth Streets, SE., discharge the sewage from 162 houses into Anacostia River. Studies are now underway for the removal of this sewage from the river to the pumping station. On Benning Road a sewer serving 10 houses discharges into Anacostia River.

THE POTOMAC RIVER BELOW WASHINGTON.

The Potomac becomes a tidal stream about 3 miles above the mouth of Rock Creek. From this point down it gradually widens and changes its physical character. From Washington to the mouth there is a narrow deep channel, on both sides of which extend flats covered with shallow water at all times.

Alexandria.—Seven miles below Washington is the city of Alexandria, Va., with a population of 15,329. There is a public water supply owned by the Alexandria Water Co. and derived from Cameron Run. The water is pumped from the creeks to two reservoirs having a capacity of 16,000,000 gallons. The average daily consumption is about 1,000,000 gallons. A serious epidemic of typhoid fever occurred during the summer of 1914, the cause of which was found to be infection of the water supply. The condition was

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remedied by the installation of a chlorine apparatus. Work has been going on for a year or more, which will soon result in a sufficient and safe supply from Holmes Run and Black Lick Creeks. About 60 per cent of the town is served by a sewerage system. These sewers discharge into the Potomac River at five points along the water front and into Hunting Creek at two points. The chief industrial wastes are from a large brewery and from a fertilizer plant which reduces pyrites.

Settlements near Alexandria.—Between Alexandria and Washington are a number of small settlements—Rosemont, Virginia Highlands, and Dulany—some of which are partially sewered, the discharges emptying into the river directly or by way of small creeks. The railroad yards, with 1,200 employees, have sewers to the river. Fort Myer, Va., with a normal population of about 900, derives its water supply from the Potomac River near Three Sisters. The water is filtered by rapid sand filters. About 259,000 gallons are used daily. The sewage from the fort is discharged untreated into the Potomac.

Fort Washington, Fort Hunt, Mount Vernon.—The next points of pollution are at Fort Washington, Md., and Fort Hunt, Va., located on opposite sides of the river about 5 miles below Alexandria. These forts have normal populations, respectively, of 900 and 175. Each has a water supply derived from deep wells, the average daily consumption being, respectively, 380,000 and 100,000 gallons. The sewage from each fort is discharged directly into the Potomac River. Two miles below the forts is located Mount Vernon, George Washington's home.

Indianhead.—The next point of pollution is at the United States proving ground and powder factory at Indianhead, Md. At this point the sewage of 250 persons is discharged into the Potomac. Into Mattawoman Creek runs a certain amount of water containing nitric and sulphuric acids. Large quantities of sodium sulphate are piled on the bank, and some of this is washed into the stream during rains.

Occoquan Creek and Bay.—Almost opposite Indianhead are Occoquan Bay and the mouth of Occoquan Creek. This stream has a watershed of 594 square miles, on which there is a population of 38.1 persons per square mile. Warrenton, the largest town on this watershed, with a population of 1,431, has a water supply derived from springs and a well, but no sewerage system.

There is no other town of importance on this stream, although it receives the indirect drainage of Haymarket, Manassas, Clifton, and Occoquan, Va. Manassas has voted for a bond issue for the construction of water and sewerage systems.

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Cherry Hill.—The garbage-reduction plant which handles the garbage of Washington is located at Cherry Hill, Va., just below Occoquan. The only waste from this plant is leakage from the piles of solid refuse left after all the oils have been extracted. A sample of the liquid seepage from this refuse on analysis showed an enormous bacterial count, but no *B. coli.* It is therefore relatively unimportant from a sanitary standpoint.

Popes Creek.—Below Occoquan Bay the river receives the slight indirect drainage from Quantico and Widewater, small towns on the Virginia shore. There are no other points of importance until Popes Creek, Md., is reached, a distance of 55 miles below Washington. This is the terminus of the Popes Creek Branch of the Pennsylvania Railroad. Popes Creek is about the upper limit of the oyster beds in the Potomac River. The water at this point is brackish, the salt and fresh water, under ordinary conditions of stream and tide flow, meeting near Sandy Point, about 14 miles above Popes Creek.

Colonial Beach.—The next town of note is Colonial Beach, Va., about 68 miles below Washington. This is the largest town on the river between Alexandria and Point Lookout. During the months of July and August the town is visited almost daily by several hundreds of excursionists from Washington and vicinity, and the summer population is said to number 10,000 persons. The population throughout the remainder of the year is about 1,000.

During the summer of 1913 a public water supply and sewerage system was completed and the principal buildings of the town connected with them. The remaining houses are to be connected with the sewerage system as rapidly as the extensions can be made. The sewage is pumped into a septic tank divided into compartments, so that the correct storage may be had at all times of the year. The effluent from this tank discharges into Monroe Bay not far from its mouth. During the summer the amount of sewage discharged is sufficient to discolor markedly the water in the bay over the outlet. An examination in the winter showed the effluent to be only slightly turbid, with no disagreeable odor, and containing *B. coli* in 0.01 c. c. but not in 0.001 c. c. During the oyster season samples of water taken in Monroe Creek in the vicinity of the sewage-disposal plant and at the outlet of Monroe Creek on the ebb tide did not show evidences of gross pollution, while samples of water taken from the Potomac River in the general locality of Monroe Creek were not markedly different from samples several miles distant.

The public water supply of Colonial Beach is derived from an artesian well several hundred feet in depth, and many of the houses are also supplied by private artesian wells. It is worthy of note that during the period from August, 1913, to June, 1914, only two cases

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of typhoid fever occurred at Colonial Beach and that both of these persons were proved to have contracted the disease during the month of August at places other than Colonial Beach. It is also of interest to observe that not a single case of typhoid fever occurred at Colonial Beach during the oyster season, notwithstanding the fact that the oysters dredged from the Potomac River in the vicinity are cheap and plentiful and form one of the principal daily articles of diet for the people in this region. It is a common sight to see persons about the wharves and neighboring streets opening oysters with pocket-knives, without stopping to wash the outside of the shells, and eating the oysters directly from the shells.

Rivers entering Potomac near Colonial Beach.—The river at Colonial Beach is about 5 miles wide. Nearly opposite this point is the Wicomico River, which is a large stream or estuary. At Rock Point, about 1½ miles above the mouth, is located Lancaster Wharf. This is a scattered community of about 200 persons. About 125 yards below the wharf is a culvert, draining a marshy area, into which the privies of a dozen houses drain. (Figs. 13 and 14.) There are oyster beds only 50 yards from this point. At the wharf is an oyster shucking and packing house. Artesian water is used for washing the oysters, which are packed in tin cans.

In Nomini Creek are the small communities of Mount Holly, Va., and Nomini Ferry, Va. This creek has many oyster layings and its shores are fairly populated. Farther down, on the Yeocomico River, is Kinsale, Va., with a population of about 250. At this point are three establishments, employing about 150 hands, who are engaged in canning tomatoes during the canning season. There is also one plant which handles fish and oysters during the winter. The water used in the process is obtained from artesian wells.

St. Clements and Bretons Bay.—About opposite the Yeocomico River are St. Clements and Bretons Bay, which are fairly large estuaries. Near the head of Bretons Bay is Leonardtown, Md., with a population of 526. The town is without public water supply or sewerage, the inhabitants depending on private wells for the former. There are two institutions in Leonardtown—St. Mary's Academy, a girls' school, and Leonard Hall, a boys' school.

Piney Point.—About 12 miles below the entrance to Bretons Bay is Piney Point, on which there is a group of houses and a hotel, which during the summer months has 50 or more guests, the total population during the summer being 100 or less persons. No sewage of consequence reaches the river from this point, at any rate during the winter months.

St. Georges Island.—A few miles below Piney Point is St. Georges Island, on which there are a few summer cottages, the winter or permanent population being very small. There is no sewage of any

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moment from this place. Between St. Georges Island and Point Lookout the St. Marys River joins the Potomac River. This river is a large estuary, at the head of which is St. Marys, a small community, which includes a school for girls. Little sewage enters from this point.

Coan River.—About opposite the St. Marys River on the Virginia side is Coan River, a broad estuary, which, after running for a mile or so, divides into three branches. About 1 mile from the entrance is Lewisetta, which comprises a few houses and a large wharf, on which is a "fish factory," where herring are salted during the spring run, and during the summer months oil is extracted from large numbers of menhaden brought in by fishing steamers, the "scrap" or residue of the fish being utilized in the manufacture of fertilizers. Although sewage reaches the river from only a few houses and from fishing steamers while in port, a large amount of organic matter is found and the mud from the bottom has an offensive odor, which indicates putrefactive changes in the immediate vicinity. One of the few samples of oysters showing an excessive number of *B. coli* came from between the fish wharf and the drain from a private residence.

Below Coan River.—There are no communities between Coan River and Smith's Point, which is at the south limit of the junction of the Potomac River with the Chesapeake Bay. While there are few statistics available as to the prevalence of typhoid fever in these scattered communities along the lower river, the unanimous opinion of both the medical profession and the community at large is that the common use of artesian wells, which are found all over that district, has resulted in a very marked lessening of typhoid fever and a general improvement in the health of the communities fortunate enough to use them. The same change consequent upon the use of these wells has been noted upon the Great Wicomico and other rivers.

As is shown by the map, the drainage area on the Virginia side below Maryland Point is small, and there is no source of considerable pollution except at Colonial Beach, while on the Maryland side the population is small, and there are no communities on the river, and only such small villages as Leonardtown (532) and St. Marys on the estuaries. It is probable, therefore, that the reinfection of the lower river with *B. coli* comes from agricultural sources and the stock farms at Church Point, Pope's Creek, and Lower Cedar Point (Morgantown) rather than from human sources.

ADDITIONAL DATA ON THE SANITARY CONDITIONS OF THE POTOMAC RIVER DRAINAGE BASIN.

The data derived from direct inspection on the inhabited portions of the watershed have now been detailed. It remains to supplement

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these observations with material from other sources before summarizing the extent and nature of the pollution of the stream.

Prevalence of typhoid fever.—The prevalence of typhoid fever has been shown to be unduly high by the illustrative instances given in the preceding survey. In tables 5, 6, and 7 are included the data on this matter furnished by the State health authorities of the areas concerned. After considering all available information, it is believed that the population of the upper portion of the Potomac watershed has from 500 to 600 cases of typhoid fever per 100,000 per annum. Since this population above the city of Washington amounts to about 65,000 people directly polluting the streams, it follows that the main river must carry away every year the discharges from about 375 to 400 cases of typhoid fever. These discharges may in many instances receive some preliminary treatment before reaching the streams, and it is estimated that about 16,200 people discharge some 2,600,000 gallons of sewage per diem, which has been treated in sewage-disposal plants of some description. Capt. D. D. Gaillard, Corps of Engineers, United States Army, has estimated that it takes from four to seven days for river water at Cumberland to reach Washington. (Ann. Rep. Chief of Engineers, U. S. A., 1894.) The nearest probable source of any considerable amount of pollution is at Brunswick, from which it probably takes less than 24 hours for river water to reach Washington.

TABLE 5.—*Typhoid fever in that part of Virginia on the Potomac River watershed from June 1, 1913, to June 1, 1914*—Continued.

[Data furnished by the commissioner of health of Virginia.]

Name of place.	Number of cases reported June, 1913, to June, 1914.	Number of cases reported October, 1912, to September, 1913.	Number of cases estimated October, 1912, to September, 1913.	Population, census of 1910.
Alexandria County	22	16	23	10,231
Alexandria City	1	.....	.....	15,329
Potomac	.....	.....	.....	559
Falls Church	.....	.....	.....	1,128
Augusta County	129	109	199	32,445
Staunton	4	.....	.....	10,604
Mount Sidney	.....	.....	.....	221
New Hope	8	.....	.....	106
Greenville	.....	.....	.....	359
Basic City	4	.....	.....	1,632
Waynesboro	27	.....	.....	1,389
Clarke County	37	35	59	7,466
Berryville	4	.....	.....	576
Frederick County	156	115	181	12,757
Winchester	95	.....	.....	5,864
Middletown	.....	.....	.....	363
Stephen City	13	.....	.....	483
Highland County	25	14	22	5,317
Monterey	9	.....	.....	240
Page County	11	42	83	14,147
Luray	1	.....	.....	1,218
Stanley	.....	.....	.....	218

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TABLE 5.—*Typhoid fever in that part of Virginia on the Potomac River watershed from June 1, 1913, to June 1, 1914*—Continued.

Name of place.	Number of cases reported June, 1913, to June, 1914.	Number of cases reported October, 1912, to September, 1913.	Number of cases estimated October, 1912, to September, 1913.	Population, census of 1910.
Rockingham County	87	74	114	34,903
Harrisonburg	12	.....	.....	4,879
Bridgewater	3	.....	.....	859
Dayton	2	.....	.....	516
Mount Crawford	.....	.....	.....	228
Singer Glen	6	.....	.....	110
Broadway	5	.....	.....	416
Timberville	4	.....	.....	240
Elkton	7	.....	.....	873
Shendon	.....	.....	.....	456
Shenandoah County	136	124	187	20,942
Mount Jackson	8	.....	.....	479
Strasburg	14	.....	.....	762
Woodstock	14	.....	.....	473
New Market	13	.....	.....	638
Edinburg	12	.....	.....	574
Warren County	38	16	30	8,589
Front Royal	27	.....	.....	1,133
Loudoun County	76	44	82	21,167
Hillsboro	3	.....	.....	138
Round Hill	7	.....	.....	379
Waterford	2	.....	.....	331
Leesburg	19	.....	.....	1,597
Lovettsville	11	.....	.....	192
Middleburg	.....	.....	.....	263
Hamilton	6	.....	.....	315
Purcellville	1	.....	.....	388
Westmoreland County	60	46	93	9,313
Colonial Beach	5	.....	.....	721
Prince William County	36	29	52	12,026
Dumfries	.....	.....	.....	158
Haymarket	.....	.....	.....	162
Manassas	12	.....	.....	1,217
Occoquan	.....	.....	.....	246
Fauquier County	119	79	146	22,526
Warrenton	22	.....	.....	1,427
Remington	10	.....	.....	251
Upperville	.....	.....	.....	296
Fairfax County	27	25	49	20,536
Clifton	.....	.....	.....	204
Herndon	1	.....	.....	802
Wiehle	.....	.....	.....	70
Fairfax	12	.....	.....	413
Vienna	3	.....	.....	578

TABLE 6.—*Typhoid fever on the Potomac River watershed of Maryland.*

[From information furnished by the State health officer of Maryland.]

Place.	Number of cases reported during—								Population, 1910 census.
	1907	1908	1909	1910	1911	1912	1913	June 1, 1913, to June 1, 1914.	
Adamstown	2	3	7	1	2	0	0	.....	256
Araby	4	0	1	2	1	0	1	.....	25
Ardwick	(1)	1	(1)	(1)	(1)	(1)	(1)	.....	21
Allegany Hospital	.....	.....	.....	.....	.....	1	(1)	.....	150
Barton	2	(1)	3	(1)	(1)	(1)	1	.....	1,287
Bell Alton	(1)	.....	10	.....	1	.....	(1)	.....	250
Bethesda	4	0	.....	.....	.....	2	(1)	.....	75
Barnesville	1	.....	1	1	5	(1)	(1)	.....	125
Beaver Creek	.....	.....	.....	1	.....	1	(1)	.....	72
Bigpool	.....	4	2	2	6	1	.....	.....	125
Boonsboro	1	1	.....	.....	.....	.....	.....	1	759

[1] No report.

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TABLE 6.—*Typhoid fever on the Potomac River watershed of Maryland*—Contd.

Place.	Number of cases reported during—								Population, 1910 census.
	1907	1908	1909	1910	1911	1912	1913	June 1, 1913, to June 1, 1914.	
Boyds	2	1	1	1	.....	.....	(1)	.....	250
Bradelock	.....	.....	.....	.....	.....	1	(1)	.....	.....
Big Spring	.....	.....	.....	.....	2	.....	(1)	.....	50
Berwyn	.....	.....	4	2	1	.....	.....	.....	150
Brentwood	.....	2	2	1	1	2	(1)	.....	200
Bakersville	.....	.....	1	.....	.....	.....	(1)	.....	27
Berry	.....	.....	.....	.....	.....	1	(1)	.....	40
Brunswick	28	35	13	30	16	14	3	64	3,721
Buckeyestown	2	12	12	2	3	2	0	.....	85
Bryantown	.....	.....	9	3	18	.....	.....	.....	120
Burdett	2	.....	.....	.....	.....	.....	(1)	.....	23
Burkettsville	.....	8	2	0	0	1	2	3	228
Borden Shaft	.....	.....	1	.....	.....	.....	(1)	.....	39
Borden Mine	.....	.....	1	.....	.....	.....	(1)	.....	.....
Camp Springs	.....	.....	1	.....	.....	.....	(1)	.....	60
Capital Heights	.....	1	0	2	11	3	2	.....	275
Carlos	.....	.....	1	.....	.....	1	(1)	.....	500
Clear Spring	.....	1	25	5	11	1	4	10	521
Clarksburg	1	0	.....	3	.....	.....	(1)	.....	150
Clinton	1	.....	5	3	.....	.....	(1)	.....	100
Compton	.....	2	.....	.....	.....	.....	(1)	.....	75
Comas	2	.....	.....	.....	1	1	(1)	.....	75
Chewsville	1	1	1	1	.....	1	(1)	.....	152
Chevy Chase	.....	.....	1	1	2	.....	(1)	.....	.....
Corriganville	.....	.....	1	0	1	0	1	.....	100
Cumberland	121	66	118	560	320	196	160	299	21,839
South Cumberland	.....	.....	.....	.....	6	1	(1)	.....	.....
"Near Cumberland"	.....	.....	.....	.....	2	.....	(1)	.....	.....
Dam No. 4	.....	.....	.....	.....	1	0	(1)	.....	.....
Downsville	1	.....	.....	1	1	6	(1)	.....	152
Dargan	.....	.....	1	.....	.....	.....	(1)	.....	60
Derwood	.....	1	2	2	0	0	(1)	.....	72
Doubs	.....	1	.....	.....	.....	.....	(1)	.....	37
Dickerson	.....	.....	4	1	.....	8	(1)	.....	125
District No. 10	.....	.....	1	.....	.....	.....	(1)	.....	.....
Eckhart	.....	.....	6	2	0	2	(1)	.....	1,600
Eckhart Mines	.....	.....	1	0	4	3	2	.....	.....
Ellerslie	1	0	0	0	0	0	(1)	.....	600
Etchinson	1	0	0	0	0	0	(1)	.....	58
Eakles Cross Roads	.....	.....	4	0	0	0	0	.....	.....
Eakles Mills	.....	.....	.....	.....	1	1	0	.....	120
Emmitsburg	0	0	1	.....	.....	.....	(1)	1	1,064
Fairview	.....	1	0	0	0	0	(1)	.....	97
Fairplay	.....	.....	1	1	6	0	(1)	.....	.....
Frederick	37	26	50	52	62	49	2	22	1,441
Forest Glen	.....	2	0	0	0	0	(1)	.....	70
Forestville	.....	2	0	4	2	2	(1)	.....	100
Flint Hill	2	0	0	0	0	0	(1)	.....	.....
Frostburg	2	24	19	19	47	21	2	5	6,028
Flintstone	0	0	2	0	0	0	(1)	.....	250
"Near Frederick"	.....	.....	.....	.....	4	0	(1)	.....	.....
Franklin	0	0	0	0	0	17	(1)	.....	.....
Funkstown	.....	.....	1	0	0	0	4	0	568
Gapland	0	0	.....	.....	.....	1	1	.....	100
Gaithersburg	.....	2	1	2	0	0	(1)	0	625
Germantown	1	.....	4	0	1	0	(1)	.....	250
Gilmore	3	0	0	1	1	0	(1)	.....	125
Great Falls	2	0	0	0	0	0	(1)	.....	93
Hagerstown	35	46	44	46	41	36	19	97	16,507
Hancock	8	5	9	3	1	5	1	50	893
Hunting Hill	.....	4	.....	.....	.....	.....	(1)	.....	35
Hyattsville	1	3	3	2	0	3	0	4	1,917
Ijamsville	2	0	1	0	1	2	0	.....	70
Johnsville	1	0	0	0	0	0	(1)	.....	196
Issue	0	0	1	0	0	0	(1)	.....	57
Knoxville	3	0	0	1	0	4	(1)	.....	363
Kensington	0	1	1	0	2	0	(1)	0	689
Keedysville	1	1	0	1	18	10	1	7	367
Kearney	1	0	0	0	0	0	(1)	.....	.....
La Plata	1	0	20	1	2	8	3	0	269
Lonaconing	6	14	13	46	21	9	4	18	1,553
Leitersburg	0	1	2	2	1	0	(1)	.....	340
Libertytown	3	0	2	0	0	1	(1)	.....	589
Linden	2	0	0	0	0	0	(1)	.....	57

[1] No report.

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TABLE 6.—*Typhoid fever on the Potomac River watershed of Maryland*—Contd.

Place.	Number of cases reported during—								Population, 1910 census.
	1907	1908	1909	1910	1911	1912	1913	June 1, 1913, to June 1, 1914.	
Mason Spring	1	0	1	0	0	0	(1)	.....	55
Monrovia	0	1	0	3	1	1	(1)	.....	275
Midland	1	.....	.....	.....	2	1	(1)	4	1,173
Middletown	1	0	5	3	6	9	1	9	692
Montrose	1	1	.....	.....	.....	.....	(1)	.....	30
Mount Pleasant	5	0	0	0	2	4	(1)	.....	125
Mount Ephraim	0	0	1	0	0	0	(1)	.....	.....
Mount Airy	0	0	0	0	1	0	(1)	8	622
Mount Savage	2	0	0	1	3	3	4	.....	2,000
Mount Rainier	0	3	1	0	0	0	(1)	1	1,242
Myersville	0	0	3	0	6	5	(1)	.....	475
New Market	3	3	4	8	6	2	(1)	2	320
New Windsor	1	0	0	0	0	0	2	1	446
New London	2	0	0	0	0	0	0	.....	100
Norbeck	1	6	0	3	.....	.....	.....	.....	50
North Branch	1	0	0	.....	.....	.....	.....	.....	.....
Newport	0	0	7	2	2	1	(1)	.....	50
Newburg	0	0	2	0	1	0	(1)	.....	87
National	0	0	0	4	0	0	(1)	.....	.....
New London, near	.....	.....	.....	.....	1	0	(1)	.....	100
Oxen Hill	1	0	3	0	0	0	(1)	.....	65
Oakdale	0	0	0	2	0	0	(1)	.....	53
Olney	0	0	2	0	0	0	(1)	.....	150
Potomac	3	7	0	0	0	0	(1)	.....	127
Park Mills	1	0	0	0	0	0	(1)	.....	80
Paradise	.....	.....	2	.....	.....	.....	(1)	.....	.....
Pearl	3	.....	.....	.....	.....	2	(1)	.....	52
Pomonkey	4	1	2	0	1	0	(1)	.....	200
Pomfret	.....	.....	.....	.....	.....	4	(1)	.....	60
Poolsville	1	0	1	0	0	5	3	0	175
Pondsville	0	1	0	0	0	1	(1)	.....	100
Pisgah	0	0	3	.....	1	0	(1)	.....	150
Pope Creek	0	0	1	0	0	0	(1)	.....	67
Rockville	19	11	3	16	9	5	(1)	35	1,181
Rock Bridge	1	0	0	0	0	0	(1)	.....	.....
Rock Point	0	0	3	0	0	0	(1)	.....	476
Rocky Ridge	.....	.....	.....	.....	1	1	(1)	.....	125
Rohpersville	0	0	0	2	1	2	(1)	.....	200
Riverdale	0	3	2	.....	1	1	(1)	.....	125
Rosecroft	.....	.....	.....	1	.....	.....	.....	.....	50
Ringgold	.....	.....	.....	.....	1	0	(1)	.....	114
Smithsburg	2	0	2	2	10	4	10	7	481
Sabillasville	1	0	0	0	0	0	2	.....	180
Silver Spring	0	3	0	1	0	0	(1)	.....	200
Silver Hill	0	7	0	0	0	0	(1)	.....	110
Sellman	0	0	2	2	2	2	(1)	.....	100
Sharpsburg	0	0	2	0	5	0	(1)	8	961
Sandy Spring	0	0	1	0	4	3	(1)	.....	135
Sandy Hook	0	0	0	0	0	1	(1)	.....	.....
"T. B."	1	0	2	1	2	0	(1)	.....	65
Tippett	.....	1	.....	.....	.....	.....	(1)	.....	20
Trego	.....	.....	.....	.....	0	1	1	.....	75
Travillah	2	0	0	1	0	0	(1)	.....	50
Thurston	1	.....	.....	.....	.....	.....	(1)	.....	.....
Takoma Park	.....	0	1	0	0	2	(1)	8	1,212
Urbanna	2	0	0	0	4	1	(1)	.....	219
Utica Mills	1	1	0	0	0	0	(1)	.....	60
Security	.....	.....	.....	0	6	0	(1)	.....	.....
Wheaton	1	0	2	.....	.....	.....	(1)	.....	71
Waldorf	.....	1	0	5	26	1	(1)	.....	250
Walkersville	3	0	0	1	4	0	(1)	4	582
Westernport	0	1	0	0	0	15	44	120	2,702
White Plains	1	1	.....	.....	1	0	(1)	.....	100
Woodsboro	1	.....	.....	6	4	1	1	3	362
Woodville	1	0	.....	.....	.....	.....	(1)	.....	48
Weverton	.....	.....	.....	1	3	10	.....	.....	136
Wayside	.....	.....	1	.....	.....	.....	.....	.....	200
Williamsport	.....	6	13	12	3	.....	(1)	7	1,571
Western Maryland Hospital	.....	.....	.....	.....	.....	11	.....	.....	.....
Westminster	.....	.....	.....	.....	.....	.....	.....	7	3,295

[1] No report.

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TABLE 6.—*Typhoid fever on the Potomac River watershed of Maryland*—Contd.

Place.	June 1, 1913, to June 1, 1914.	Population according to census 1910.
Union Bridge	10	804
Taneytown	0	824
Kitzmillerville	3	865
Laytonsville	0	133
Point of Rocks	2	478
Thurmont	2	903
Bloomington	10	372
Garrett Park	0	185
Glen Echo	0	203
Somerset	0	173
Damascus	0	170
Bladensburg	0	460
Piscataway	0	73
Leonardtown	0	526
Charles	0	.....

NOTE.—Dr. Fulton, State health officer of Maryland, wrote with reference to the above statistics: "I may say in general about these reports that they tend to show in many cases larger numbers of persons than are actually sick at a given town. This happens because the reports do not enable us to distinguish between citizens of the towns and persons who receive their mail at the town."

TABLE 7.—*Typhoid fever on the Potomac River watershed of West Virginia.*

[From data furnished by the secretary of the State Board of Health of West Virginia.—Cases and deaths reported during the period June 1, 1913, to June 1, 1914.]

Name of community.	Population according to census of 1910.	Cases reported.	Deaths.
Bayard	417	0	0
Berkeley Springs	864	4	0
Capon Bridge	213	(1)	.....
Charles Town	2,662	(1)	.....
Elk Garden	438	5	0
Franklin	200	1	0
Harpers Ferry	766	0	0
Hedgesville	328	2	0
Keyser	3,705	(1)	.....
Martinsburg	10,698	40	9
Moorefield	646	10	0
Paw Paw	725	(1)	.....
Piedmont	2,054	(1)	.....
Romney	1,112	2	0
Springfield	135	(1)	.....
Shepherdstown	1,070	0	0
Wardensville	123	(1)	.....
Watson (Capon Springs post-office)	11	(1)	.....

[1] No report.

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The above report covers only a few of the urban communities. As the reporting of disease has just been inaugurated in the State, it is natural that as yet the report even for these towns is very incomplete. This is perhaps less true of Martinsburg and Moorefield than of the other towns.

Areas and populations on the watershed.—The areas and populations of the watershed may be found in Table 8.

TABLE 8.—*Tabulation of areas and populations in watershed of Potomac River and its tributaries.*

Stream.	Area of watershed in square miles.	Total population.			Urban population.		
		1910	1900	1890	1910	1900	1890
Savage River	115	2,560	2,551	2,131	.....	.....	.....
Georges Creek	78	12,747	11,216	7,045	8,754	7,455	3,804
Patterson Creek	278	6,786	5,482	6,346	.....	.....	.....
Wills Creek	241	11,972	11,375	9,852	1,357	1,400	1,239
Evitts Creek	118	4,529	4,450	4,205	.....	.....	.....
Direct drainage to South Branch of Potomac River	517	50,048	40,551	32,023	33,084	25,293	17,438
Total for North Branch	1,342	88,642	75,625	61,602	43,195	34,148	22,481
South Branch of Potomac River	1,558	23,003	23,243	20,518	2,333	1,634	946
Town Creek	150	7,059	6,806	6,248	.....	.....	.....
Little Capon Creek	114	1,790	1,937	1,920	.....	.....	.....
Sideling Creek	95	3,611	3,547	2,360	.....	.....	.....
Great Cacapon Creek	609	10,050	9,990	9,520	347	170	106
Great Tonoloway Creek	92	2,146	2,190	2,229	.....	.....	.....
Sleepy Creek	142	3,972	3,814	3,790	.....	.....	.....
Licking Creek	187	6,742	6,759	6,742	579	576	594
Back Creek	279	8,616	8,963	8,395	328	342	448
Conococheague Creek	582	45,694	42,251	40,586	15,376	11,528	10,617
Opequon Creek	346	28,389	24,998	23,960	16,562	12,725	12,422
Antietam Creek	289	42,124	36,939	30,933	25,881	21,184	15,602
Direct drainage to Potomac River between South Branch and Shenandoah River	503	31,253	30,343	28,053	7,370	7,354	6,500
Total for Potomac River above Shenandoah River	6,288	303,091	277,405	246,856	111,971	89,611	69,716
Shenandoah River	3,058	133,699	128,277	121,135	35,726	27,624	21,414
Catoctin Creek	122	7,126	7,630	7,676	920	894	667
Monocacy River	962	74,903	71,035	73,980	25,471	18,327	19,228
Goose Creek	384	15,899	16,240	16,607	3,238	2,867	2,693
Seneca Creek	128	7,866	7,640	6,501	928	843	.....
Rock Creek	77	92,446	78,200	64,522	89,137	74,958	61,422
Anacostia Creek	144	73,325	60,621	50,750	65,579	53,558	44,430
Direct drainage to Potomac River between Harpers Ferry and Alexandria	690	242,265	206,588	175,186	208,197	173,429	143,959
Total for Potomac River above Alexandria, Va.	11,843	950,620	853,636	763,213	539,167	442,111	363,529
Occoquan River	594	22,646	21,787	19,988	3,256	2,741	2,173
Direct drainage to Potomac River between Alexandria and mouth	1,558	64,836	64,255	56,433	3,107	2,433	1,429
Total Potomac River	13,995	1,038,102	939,678	839,634	545,530	447,285	367,131

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TABLE 8.—*Tabulation of areas and populations in watershed of Potomac River and its tributaries*—Continued.

Stream.	Rural population.			Population per square mile.					
				Total.			Rural.		
	1910	1900	1890	1910	1900	1890	1910	1900	1890
Savage River	2,560	2,551	2,131	22.2	22.2	18.5	22.2	22.2	18.5
Georges Creek	3,993	3,761	3,241	163.4	143.8	90.4	51.2	48.2	41.6
Patterson Creek	6,786	5,482	6,346	24.4	19.7	22.8	24.4	19.7	22.8
Wills Creek	10,615	9,975	8,613	49.7	47.2	40.9	44.1	41.4	35.7
Evitts Creek	4,529	4,450	4,205	40.1	39.44	37.2	40.1	39.4	37.2
Direct drainage to South Branch of Potomac River	16,964	15,258	14,585	96.8	78.4	61.9	32.8	29.5	28.2
Total for North Branch	45,447	41,447	39,121	66.1	56.4	45.9	33.9	30.9	29.2
South Branch of Potomac River	20,670	21,609	19,572	14.8	14.9	13.2	13.3	13.9	12.6
Town Creek	7,059	6,806	6,248	47.1	45.4	41.7	47.1	45.4	41.7
Little Capon Creek	1,790	1,937	1,920	15.7	17.0	16.8	15.7	17.0	16.8
Sideling Creek	3,611	3,547	2,360	38.0	37.3	24.8	38.0	37.3	24.8
Great Cacapon Creek	9,703	9,820	9,414	16.5	16.4	15.6	15.9	16.1	15.5
Great Tonoloway Creek	2,146	2,190	2,229	23.3	23.8	24.2	23.3	23.8	24.2
Sleepy Creek	3,972	3,814	3,790	26.7	26.9	26.7	26.7	26.9	26.7
Licking Creek	6,163	6,183	6,148	36.1	36.1	36.0	33.0	33.1	32.9
Back Creek	8,288	8,621	7,947	30.9	32.1	30.1	29.8	30.9	28.5
Conococheague Creek	30,319	30,723	29,969	77.5	72.6	69.7	52.1	52.8	51.5
Opequon Creek	11,827	12,273	11,538	82.0	72.2	69.2	34.1	35.5	33.3
Antietam Creek	16,243	15,805	15,331	145.8	127.8	107.0	56.2	54.7	53.1
Direct drainage to Potomac River between South Branch and Shenandoah River	23,883	22,989	21,553	62.1	60.3	55.8	47.5	45.7	42.8
Total for Potomac River above Shenandoah River	191,120	187,794	177,140	48.2	44.1	39.3	29.6	29.9	28.2
Shenandoah River	97,973	100,653	99,721	43.7	41.9	39.6	32.0	32.9	32.6
Catoctin Creek	6,206	6,736	7,009	58.4	62.5	63.7	50.9	55.2	57.4
Monocacy River	49,432	52,708	54,752	77.9	74.9	76.9	51.4	54.8	56.9
Goose Creek	12,661	13,373	13,914	41.4	42.3	43.2	33.0	34.8	36.2
Seneca Creek	6,938	6,797	6,501	54.2	53.1	50.8	61.4	59.7	50.8
Rock Creek	3,309	3,242	3,100	1,200.0	1,015.0	838.0	43.0	42.1	40.3
Anacostia Creek	7,746	7,063	6,320	509.0	421.0	326.0	53.8	40.1	43.9
Direct drainage to Potomac River between Harpers Ferry and Alexandria	36,068	33,159	31,227	356.0	304.0	258.0	53.0	49.0	46.0
Total for Potomac River above Alexandria, Va	411,453	411,525	399,684	80.2	72.0	64.4	34.7	34.7	33.7
Occoquan River	19,390	19,046	17,815	38.1	36.7	33.7	32.6	32.1	30.0
Direct drainage to Potomac River between Alexandria and mouth	61,729	61,822	55,004	41.6	41.2	36.2	39.6	39.7	35.3
Total Potomac River	492,572	492,393	472,503	72.2	67.1	60.0	35.2	35.2	33.8

A study of Table 8 indicates that there is a general movement from the rural communities and small towns to the large towns and cities. For the past 10 years this has been true to a very great degree. The rural population increased from 1900 to 1910 only 0.04 of 1 per cent, while the urban population increased 21.9 per cent. As the population of a town increases the questions of water supply and waste disposal become more complicated, and after a time it is necessary as a health measure to install a public water supply. Following this, the question of sewers becomes more important, and their construction follows as a matter of course. Thus the concentration of the population in large towns results in a constantly increasing amount of pollution of the river.

Public water supplies.—The towns on the watershed are remarkably well served by public water supplies, the majority of which are

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derived either from small feeders to the Potomac and its main branches or from springs flowing into these. The Potomac River proper serves as a source of supply only for the city of Washington. There are 63 other communities supplied with water, which had in 1910 a total population of 516,580. This is 94.7 per cent of the total urban population. A total population of 396,285 is supplied with water, either filtered or treated with chlorine, or both. Approximately 85,000,000 gallons of water are used daily by the above towns, of which 72,000,000 gallons are filtered or chemically treated.

Following is a tabulation of the public water supplies:

TABLE 9.—*Public water supplies in Potomac River watershed.*

Town.	Population.	Source.	Consumption.	Treatment.
			Gals. per diem.	
Bloomington, Md.	372	Piedmont supply, Savage River.	20,000	
Luke, Md.	510	Condenser Waterwork, Pulp & Paper Co.	20,000	
Piedmont, W. Va.	2,054	Savage River	510,000	
Westernport, Md.	2,702			
Frostburg, Md.	6,028	Springs	350,000	
Midland, Md.	1,173	....do	85,000	
Lonaconing, Md.	1,553	Koontz Run and Jackson River.	150,000	
Keyser, W. Va.	3,705	Springs	350,000	
Hyndman, Pa.	1,164	....do	40,000	
Cumberland, Md.	21,839	Evitts Creek	8,500,000	Rapid sand filters and hypochlorite.
Franklin, W. Va.	200	South Branch Potomac	20,000	
Moorefield, W. Va.	646	Moorefield River and spring.	15,000	
Romney, W. Va.	1,112	Springs	10,000	
Berkeley Springs, W. Va.	864	Warm Spring	72,000	
McConnelsburg, Pa.	579	Springs	20,000	
Mont Alto Sanitorium	1,250	Little Antietam Creek	100,000	Hypochlorite.
Chambersburg, Pa.	11,800	Springs	1,750,000	
Greencastle, Pa.	1,919	....do	125,000	
Mercersburg, Pa.	1,410	Buck Run	10,000	
Winchester, Va.	5,864	Rouse Spring	1,000,000	Chlorine gas.
Martinsburg, W. Va.	10,698	Spring	1,430,000	Hypochlorite.
Waynesboro, Pa.	7,199	Mountain stream	1,300,000	
Perrysville, Pa.	312	....do	20,000	
Hagerstown, Md.	16,507	Mountain stream and Antietam Creek.	2,500,000	Filtration and hypochlorite.
Basic, Va.	1,623	Spring	200,000	
Waynesboro, Va.	1,389	....do	150,000	
Staunton, Va.	10,604	Springs	1,300,000	
Bridgewater, Va.	859	....do	[1]10,000	
Harrisonburg, Va.	4,879	Dry River	600,000	
Elkton, Va.	873	Elkton Lithia Spring	90,000	
Shenandoah, Va.	1,431	Shenandoah River	150,000	
Luray, Va.	1,218	Mountain streams	250,000	
Mount Jackson, Va.	479	Springs	40,000	
Edinburg, Va.	574	....do	15,000	
Woodstock, Va.	1,314	....do	100,000	
Strasburg, Va.	769	....do	100,000	
Riverton, Va.	670	Front Royal system	100,000	Rapid sand filters and hypochlorite.
Front Royal, Va.	1,133	Happy Run	400,000	
Berryville, Va.	876	Springs	80,000	
Charles Town, W. Va.	2,662	Spring and creek	400,000	
Brunswick, Md.	3,721	Wells	60,000	
Middletown, Md.	692	Spring	60,000	
Burkittsville, Md.	228	....do	5,000	
Gettysburg, Pa.	4,030	Marsh Run	400,000	Do.
Maryland Tuberculosis Sanitarium.	550	Spring and wells	50,000	
Emmitsburg, Md.	1,054	Mountain stream	150,000	
Littlestown, Pa.	1,347	Wells	95,000	
Tarrytown, Md.	842	....do	40,000	

[1] Near.

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TABLE 9.—*Public water supplies in Potomac River watershed*—Continued.

Town.	Population.	Source.	Consumption.	Treatment.
			Gals. per diem.	
Westminster, Md.	3,295	Spring and wells	280,000	
New Windsor, Md.	446	Springs	40,000	
Union Bridge, Md.	804	Wells	140,000	
Thurmont, Md.	903	High Run	90,000	
Walkersville, Md.	582	Spring	45,000	
Frederick, Md.	10,411	Tuscarora and Fishing Creeks.	2,500,000	
Braddock Heights	[1]1,200	Spring	35,000	
Rockville, Md.	1,181	Wells	20,000	Hypochlorite.
Tacoma Park	1,242	Stream	40,000	Rapid sand filters.
Hyattsville, Md.	1,917	Wells	150,000	
Round Hill, Va.	379	do	30,000	
Leesburg, Va.	1,597	Spring and well	140,000	
Warrenton, Va.	1,427	do	130,000	
Alexandria, Va.	15,329	Holmes Run	1,000,000	
Washington	331,069	Potomac River	5,700,000	Slow sand filters.
Colonial Beach, Va.	721	Wells	50,000	

[1] Summer.

Sewerage systems.—In the matter of sewers the towns are not nearly so progressive, there being several large cities having no sewerage systems. There is a total of about 394,000 people served by sewers and this number discharges in the neighborhood of 63,000,000 gallons of sewage daily into the Potomac and its tributaries. The sewage of 16,200 people (about 2,600,000 gallons) is treated in sewage-disposal plants. Public sentiment is slowly reaching a point where the discharge into a stream of such quantities of crude sewage as will create a nuisance will be prohibited, and the installation of some form of treatment will be required. Table 10 contains information regarding sewerage systems on the watershed.

TABLE 10.—*Sewerage systems in Potomac River watershed.*

Town.	Population 1910.	Population served by sewers.	Discharges into—	Treatment.
Piedmont, W. Va.	2,054	2,054	North Branch Potomac	
Luke, Md.	2,702	2,702	North Branch Potomac and Georges Creek.	
Frostburg, Md.	6,028	3,000	Georges Creek	
Lonaconing, Md.	1,553	1,553	do	
Keyser, W. Va.	3,705	3,705	New Creek and North Branch Potomac.	
Hyndman, Pa.	1,164	300	Wills Creek	
Allegheny Grove		100	Braddocks Run	
Cumberland, Md.	21,839	20,000	Wills Creek, Potomac River, and canal.	
Franklin, W. Va.	200	100	South Branch Potomac	
Moorefield, W. Va.	646	200	Moorefield River	
Romney, W. Va.	1,112	500	South Branch Potomac	
Berkley Springs, W. Va.	864	1,000	Warm Spring Run	
South Mountain Sanatorium.	1,250	1,250	Conococheague Creek	Septic tank.
Chambersburg, Pa.	11,800	3,000	do	Sprinkling filters, sand filters, Imhoff tanks, settling tanks.
Mercersburg, Pa.	1,410	900	do	Screens; sand filters.
Winchester, Va.	5,864	5,864	Opequan Creek	
Martinsburg, W. Va.	10,698	500	Tuscarora Creek	
Hagerstown, Md.	16,507	2,000	Antietam Creek	

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TABLE 10.—*Sewerage systems in Potomac River watershed*—Continued.

Town.	Population 1910.	Population served by sewers.	Discharges into—	Treatment.
Basic Va.	1,623	800	Shenandoah River.	
Waynesboro, Va.	1,389	1,000	.....do.	
Staunton, Va.	10,604	6,000	.....do.	
Bridgewater, Va.	859	100	.....do.	
Harrisonburg, Va.	4,879	4,879	.....do.	
Elkton, Va.	573	100	.....do.	
Luray, Va.	1,218	500	.....do.	
Mount Jackson, Va.	479	400	.....do.	
Edinburg, Va.	574	100	.....do.	
Strasburg, Va.	769	150	.....do.	
Front Royal, Va.	1,133	400	.....do.	
Brunswick, Md.	3,721	1,000	Potomac River.	
Middletown, Md.	692	100	Catoctin Creek, Md.	
Gettysburg, Pa.	4,030	4,030	Monocacy River.	Septic tank and hypochlorite.
Maryland Tuberculosis Sanitarium.	550	550	Underground tiles.	Septic tank and underground filters.
Emmitsburg, Md.	1,054	1,500	Monocacy River (Toms Creek).	
Tarrytown, Md.	842	20	Monocacy River.	
Frederick, Md.	10,411	4,000	.....do.	
Leesburg, Va.	1,597	500	Tuscarora Creek.	
Environs of Washington.	17,020	5,000	Rock Creek, Little Falls Brook, and Antacostia River.	None.
Takoma Park.	1,242	1,000	Anacostia Creek.	Sand beds and irrigation.
Hyattsville, Md.	1,217	1,500	.....do.	
Washington, D. C.	331,069	300,000	Potomac River.	Screens and short period of sedimentation.
Alexandria, Va.	15,329	9,000	.....do.	
Colonial Beach, Va.	721	500	Potomac River—Monroe Bay.	Septic tank.
Alexandria environs.	4,000	2,000	Potomac River.	

Trade wastes in Potomac River watershed.—A considerable amount of liquid trade wastes enters the streams and in many cases renders them offensive and disagreeable to the eye as well as unfit for drinking purposes. The most important wastes are from coal mines, tanneries, dye works, and paper mills. The acid-iron waters which are derived from the coal mines in the upper part of the watershed undoubtedly constitute the greatest source of pollution and probably have a greater influence on the character of the stream than any other wastes. It is impossible to estimate the amount of this waste. The next important waste is that from the numerous tanneries which are scattered throughout the watershed above Washington. The total amount of such waste is about 600,000 gallons per day. This in many cases renders the stream offensive, kills the fish, and from an esthetic standpoint is the most important waste in the watershed. Realizing that there is no known efficient method for the disposal of this waste, the Public Health Service has undertaken an investigation with a view to evolving, if possible, a cheap and efficient method of treatment. At all the tanneries visited during the sanitary survey there was manifested by the operators a wish for a solution of this problem.

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The wastes from dye works, while of a disagreeable appearance, do not long persist in the streams and are probably of small sanitary significance. Paper-mill wastes from the sulphite mill at Luke have a striking effect on the river and materially change its character. This action is lessened, however, by mixture with the acid-iron wastes of Georges Creek, the result of which is descussed more fully at another point. Table 11 shows the kind and amount of the principal trade wastes in the upper watershed.

TABLE 11.—*Trade wastes in Potomac River watershed.*

Town.	Kind.	Amount.	Into—
		Gallons per day.	
Gormania, W. Va.	Tannery	10,000	North Branch Potomac.
Luke, Md.	Papel mill, sulphids	23,000,000	Do.
Keyser, W. Va.	Woolen mill		Do.
Midland, Md.	Mine water		Georges Creek.
Claysville, Md.	do		Braddocks Run.
Alleghany Grove	Distillery	150,000	Wills Creek.
Cumberland, Md.	Tannery	10,000	Do.
Do.	Ammoniacal liquors	200	Do.
Do.	Dye waste	50,000	Chesapeake & Ohio Canal.
Petersburg, W. Va.	Tannery	10,000	Lunice Creek.
Moorefield, W. Va.	do	10,000	Moorefield River.
Pawpaw, W. Va.	do	50,000	Potomac River.
Chambersburg, Pa.	Dye waste	5,000	Conococheague Creek.
Do.	Paper mill		Do.
Do.	Creamery		Do.
Mercersburg, Pa.	Tannery	100,000	Do.
Williamsport, Md.	do	60,000	Do.
Martinsburg, W. Va.	Knitting mills	35,000	Tuscarora Creek.
Hagerstown, Md.	Bleach and soda ash	70,000	Antietam Creek.
Do.	Spirit dyes	10,000	Do.
Do.	Paper mill, soda	100,000	Do.
Do.	Wash water from brewery.		Do.
Basic City, Va.	Tan extract works		Shenandoah River.
Harrisonburg, Va.	Tannery	100,000	Into town sewers.
Elkton, Va.	do	60,000	Shenandoah River.
Luray, Va.	do	150,000	Do.
Burkittsville, Md.	Distillery	6,000	Catoctin Creek.
Frederick, Md.	Dye wastes	10,000	Monocacy River.

SUMMARY ON POLLUTION OF THE POTOMAC RIVER, AS SHOWN BY A SANITARY SURVEY.

It has been shown that the waters of the upper river are continuously polluted to an extent which renders them unsuitable as supplies for domestic use, without suitable preliminary treatment, and that this pollution, on account of the undue prevalence of typhoid fever on the watershed, is of a dangerous character. The pollution of the lower river has been shown to come preponderatingly from the cities of Washington and Alexandria, that introduced below these points being practically negligible from a sanitary standpoint. A small amount of bacteriological work on the upper river has been reported confirming the estimate of the pollution obtained from the sanitary survey, but the great bulk of the laboratory work was concentrated upon the lower river, where it was necessary in order to estimate

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accurately the effect of the very important and interesting process of purification naturally operating in that area. The laboratory findings concerning pollution will next be considered.

POLLUTION AS SHOWN BY LABORATORY METHODS.

SAMPLING STATIONS AND CROSS SECTIONS.

These were selected after due consideration of the available data regarding the sewer outlets, stream flow and direction, location of flats and oyster beds, and other pertinent matters. At Great Falls, where the upper river terminates and the lower begins, daily samples are taken by the Washington filtration plant, and the data thus obtained were available. The next point at which samples were obtained was at Three Sisters Islands, in the river opposite the upper portion of the city of Washington. These two stations represent the waters of the upper river, uncontaminated, at least grossly, by wastes from the city. At the stations at D Street, red buoy, and the channel station, all located in the immediate vicinty of Washington, there are added the waters from the Chesapeake & Ohio Canal and Rock Creek, a small but polluted stream entering the river at Washington. The water of the Washington Channel contains at flood tide contamination from the sewer outlets of the city, and samples were taken here.

The first cross section was established on a line from Giesboro Point, Md., 5 miles below Three Sisters, to the Virginia Flats. On the ebb tide it represents the waters of the Potomac as constituted at Three Sisters, and in addition those of the Eastern Branch or Anacostia River and of the Washington Channel. At flood tide sewage from the sewer outlets of the city, 1 mile below, is added.

The Fort Foote cross section is 5½ miles below Giesboro Point. The river has now received the sewage of the cities of Washington and Alexandria, the latter being 1½ miles distant. The river bed is narrow at this point. The river below this becomes broader, receives Broad Creek, and, 4 miles below, at Fort Washington and Fort Hunt, again becomes narrow and deep, receiving sewage from these Army posts. Becoming wider in front of Mount Vernon, it receives Little Hunting and Piscataway Creeks. At Marshall Hall, 5 miles below Fort Washington, it is again constricted.

After receiving the waters of Dogue Creek, it again becomes narrow at Whitestone Point, 5½ miles below Fort Washington. Here there is a narrow and deep channel near the Virginia shore and much deposit on the Maryland Flats. Having received the outflow from Gunston Cove, the river becomes broader, and 6 miles below Whitestone Point is 1¼ miles wide between Indianhead and Sycamore

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Point. Just below the cross section at this point the river receives from the Virginia side the Occoquan, or historic Bull Run, which drains a considerable area of populated country. In addition to pollution, this stream brings down after rains or snows a suspension of very red clays, the influence of which may be traced for many miles down the river.

The stretch of 24 miles from Indianhead to Maryland Point, or the "wide water," varies from 1¾ miles to 4 miles in width. In addition to the pollution from Occoquan, this section receives that from the Naval Proving Station at Indianhead; the powder factory on Mattawoman Creek, on the Maryland side; the garbage-disposal plant of the city of Washington at Cherry Hill; and several small unsewered communities on the Virginia side. In addition to these sources of pollution this reach of the river presents other conditions found to be of utmost importance.

In this region first occurs the meeting of the land and sea waters with the changes consequent upon it. The wide bed and slower current, the meeting of the tide and current with resulting retardation, slack waters, and oscillations, the introduction of the suspended matters from the Occoquan, and sea water from below, combined to make this section a most interesting and important one for study. The Possum Point cross section was selected with these new factors in mind.

At Maryland Point the river takes a sharp bend from south to nearly northeast, and there is a considerable sedimentation consequent upon change of direction and increase of sea water at this cross section. From this section, "Nanjemoy Reach," there is a straight stretch of 10 miles to Popes Creek, the Mathias Point cross section. Four miles below Popes Creek is Lower Cedar Point, in the neighborhood of which is the uppermost limit of the oyster beds. The sections and stations below this to Higgins Point were selected with reference to distance from each other and such local sources of pollution as Colonial Beach.

In table 37, page 179, will be found a list of the lower stations with distances, and their location will be found in maps Nos. 4, 5, and 6, page 178.

THE COLLECTION OF SPECIMENS.

The samples for bacteriological analysis were collected in cylindrical glass-stoppered bottles having a capacity of about 175 cubic centimeters. These bottles were carefully cleansed, the stoppers and necks covered with tin foil, each bottle wrapped in manila paper, and they were then kept in a hot-air sterilizer at 160° C. for over one hour, or in an autoclave at 120° C., for over 20 minutes. Vacuum tubes were also used for the collection of bacterial samples.

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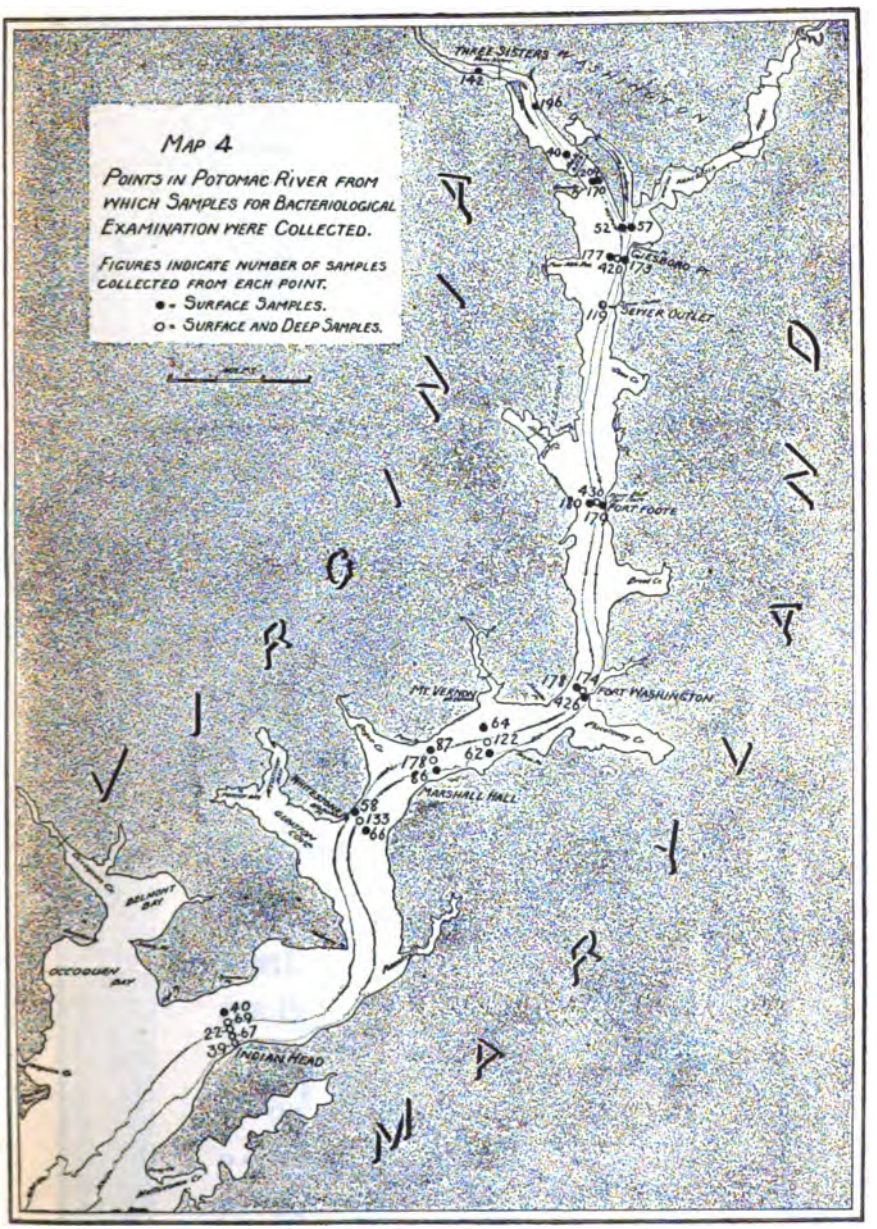

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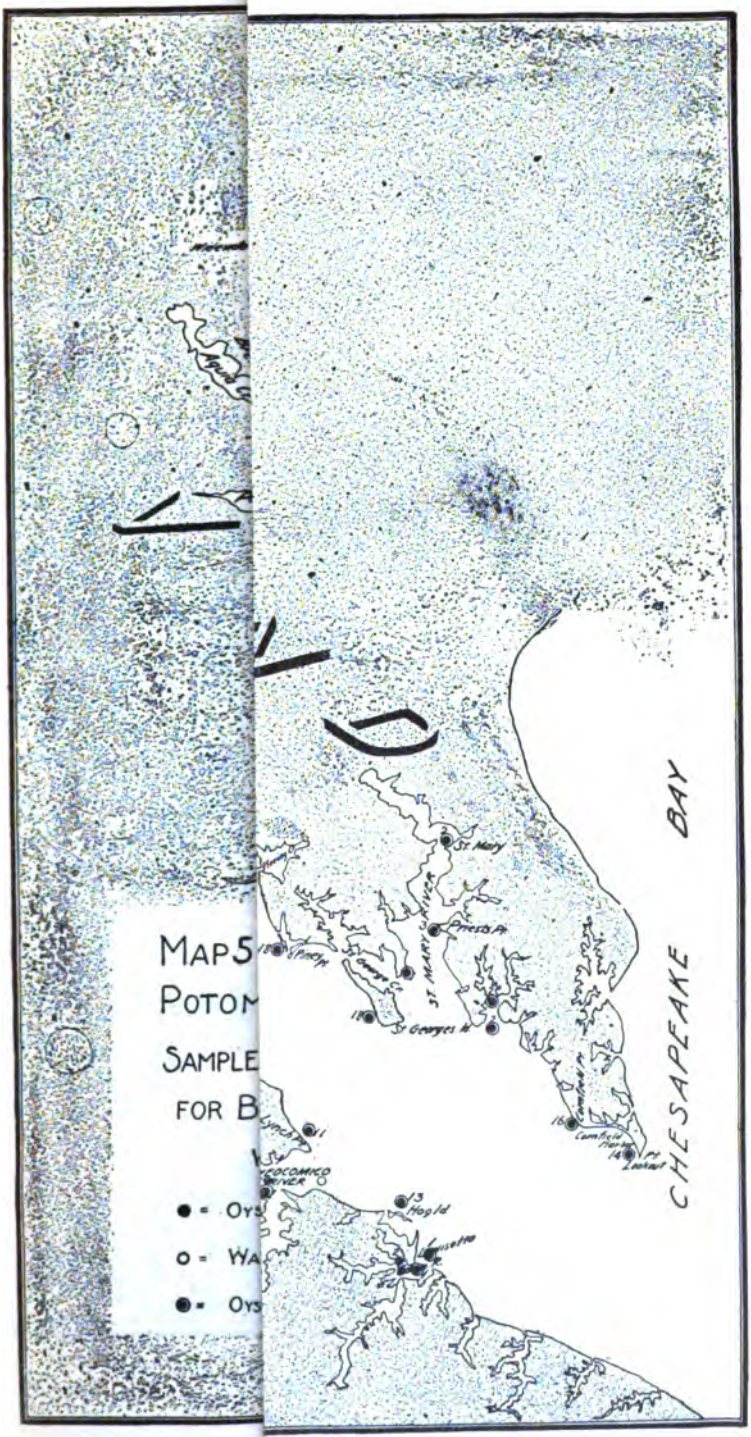

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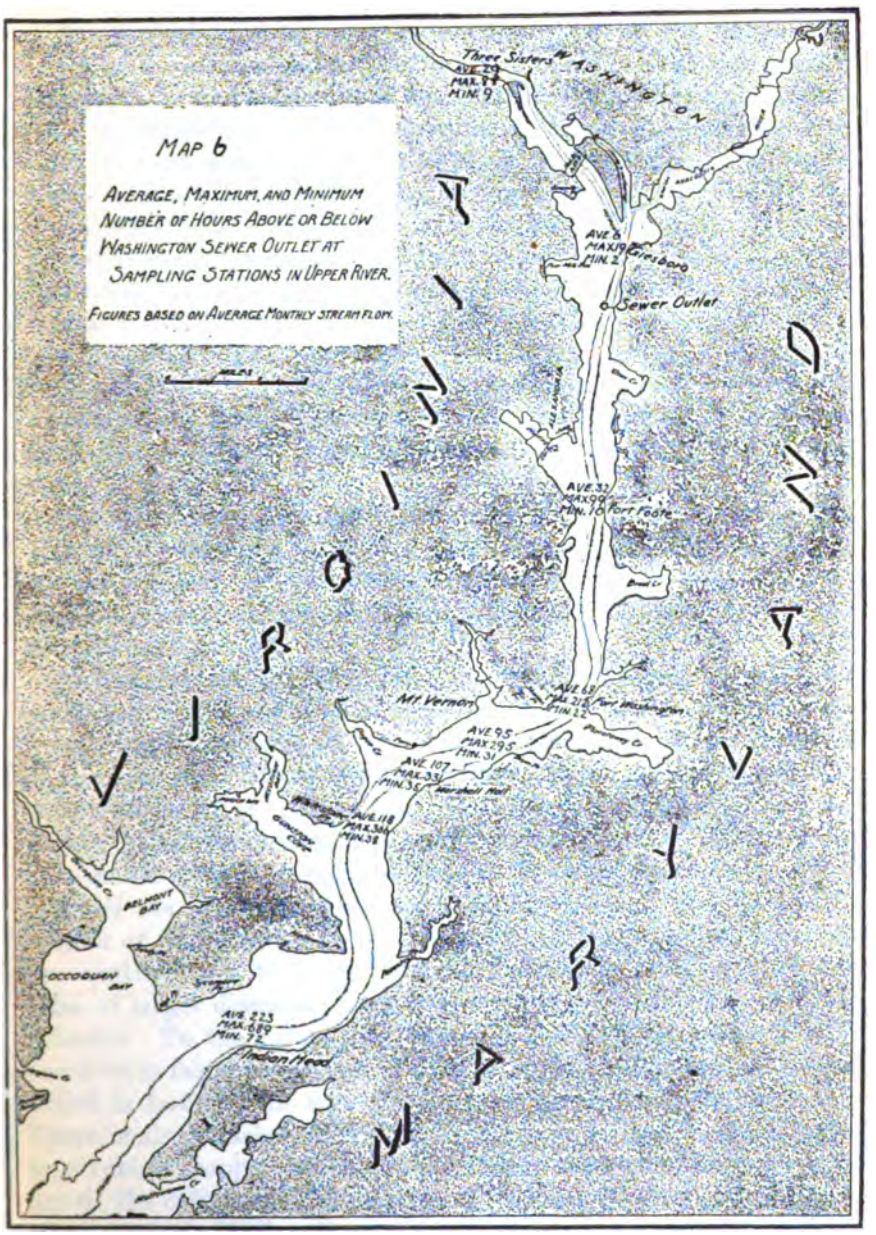

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The sample bottles for the determination of dissolved oxygen were of clear Bohemian glass with glass stoppers, having a capacity of 250 cubic centimeters.

The surface samples were collected by placing the unstoppered bottle in the holder shown by the cut (fig. 11). Various kinds of apparatus for the collection of deep samples were tried from time to time, including the Esmarch instrument, which was not found efficient for very accurate work; the vacuu mtubes with curved nicked necks, such as were used by the Metropolitan Sewage Commission, and apparatus designed by us and illustrated herewith. None answered all requirements, but for accurate bacteriologic samples, where only small quantities of water are required, the vacuum tubes, though fragile and difficult to handle in icy waters, are undoubtedly better than more elaborate apparatus, and are recommended for similar work elsewhere. The tubes used in this investigation were made in the laboratory from ordinary test tubes, but they may be purchased at small cost (4 or 5 cents each) when they are to be used in large numbers.

For the taking of samples for dissolved-oxygen determinations none of the methods heretofore used seemed applicable for this investigation, because it was desired to make an intensive study of a large number of samples from the same area, and because duplicate samples were needed.

An apparatus (figs. Nos. 12 and 13) was therefore designed, which consists primarily of a brass cylinder of such size as to hold about five times the contents of two of the bottles used for the collection of the samples. In the bottom of the cylinder are two holes about three-fourths of an inch in diameter. Below each of these is a soft rubber gasket, against which the neck of the bottle is held by means of a coiled spring beneath the bottle. Soldered into the top of the cylinder are two brass tubes, which extend through the holes in the bottom of the cylinder, so that they will be near the bottoms of the two bottles when they are in contact with the cylinder. Another tube, of larger diameter, extends about 3 inches above the top of the cylinder. To the cylinder is riveted a semicircular bucket handle, to which is fastened one end of a coiled spring, to the opposite end of which is fastened the rope for lowering and raising the apparatus. There is also attached to the top of the spring a small cord attached to a rubber stopper which fits the larger tube extending above the top of the cylinder. This cord is of such length that the weight of the apparatus filled will not extend the spring enough to pull out the cork, but when a sudden jerk is given the rope holding the apparatus the spring is extended, the small cord tightened, and the rubber stopper pulled out. Water then enters through the two tubes into the bottoms of the two sample bottles, displacing the air, which

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escapes through the large upper tube until the large cylinder is filled and the pressure thus equalized. This procedure occupies about 60 to 90 seconds, and the apparatus is then hauled on deck. The hinged bottom, in which are the springs pushing the bottles against the cylinder gaskets, is now released, and one person removes the bottles and stoppers them as the second operator raises the apparatus.

By using three of these devices it is practicable to take surface, middle, and bottom samples in duplicate at the same time and station. As many as 76 samples were taken daily in this way over an extended period of time and dissolved oxygen determinations made therefrom.

When taking samples special care was exercised to avoid error due to contamination of samples for bacteriological examination. At cross sections both surface and bottom samples were taken at one or more stations and surface samples were taken as near the shore as was practicable. The bottles were marked with a wax pencil for identification and the same mark placed upon the following sample card, together with all available data as to tide, temperature, etc.:

Sample number, _____. Date collected, _____. Hour, __ a. m., __ p. m. Source, _____.
Wind, _____. Weather, _____.
Tide, _____. Current flow, _____.
Depth collected, _____. Temperature of water, _____. Turbidity, _____.
Chlorine, _____. Diss. oxy., _____. Diss. oxy., incubated, _____. Nitrites, _____.
Nitrates, _____.

Total bacteria on—				B. coli tests.		
Agar 37°, 24 hours.		Gelatin 20°, 4 hours.		Lactose bouillon at 37°, 48 hours.		
Amount used.	Total bacteria.	Amount used.	Total bacteria.	Amount used.	Per cent gas.	Endo.
Number per c. c.						
Agar.....		Gelatin.....		B. coli		in.....c. c

Except in cold weather the bottles were immediately placed in a box containing ice and worked directly upon their arrival at the laboratory, which rarely exceeded three hours after they were taken. The samples collected by the steamship *Bratton* were plated and tubed almost immediately.

The tides and currents in the river, particularly in that section from Washington to Maryland Point, are not regular in interval or time, as are those of the open sea. They are variable, subject to

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irregularities in time, force, and direction, dependent upon the relative strength and direction of the wind, the stream flow, and tidal influences, and hence can not be predicted even for a few hours ahead. Moreover, they differ at various stations at the same time, hence the system was adopted of starting out for the collection of samples at 8.30 a. m., instead of attempting it at certain phases of tide. The large number of samples taken and the long period during which the work continued enabled the investigators by this method to cover all phases of tide and current at each station and at the same time to return the samples to the laboratory during working hours.

Oysters were secured with tongs or a light dredge worked by hand; 15 or 20 of those best suited for sampling were carefully washed in water taken from over the bed and the sample was then placed in previously sterilized heavy cloth bags, marked for identification, and the data upon the following card were filled in:

Sample number, _____. Date collected, _____. Hour, __ a. m., __ p. m. Source, _____
Wind, _____. Weather, _____.
Tide, _____. Current flow, _____.
Depth collected, _____. Temperature of water, _____. Turbidity, _____.
Chlorine, _____. Diss. oxy., _____. Diss. oxy., incubated, _____. Nitrites, _____.
Nitrates, _____.

Number of colonies on—				B. coli tests by—													
Agar 37°, 24 hours.		Agar 20°, 72 hours.		Lactose bile 37°, 72 hours.							Lactose broth 37°, 72 hours.						
Amount.	Count.	Amount.	Count.	Dilution.						Score.							Score.
				Oyster.	Gas.	Endo.	Gas.	Endo.	Gas.	Endo.		Gas.	Endo.	Gas.	Endo.	Gas.	Endo.	
				1.													
				2.													
				3.													
				4.													
				5.													
Colonies per c. c.: 20°, 37°					Rating=.....							Rating=.....					

In addition to these data, when practicable, a census of vessels and the personnel working over the oysters was made, and a large number of such records are given in connection with the detailed analysis of oyster samples.

For the purpose of collecting samples of mud from the channel an apparatus was designed by Sanitary Engineer Letton which consists

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essentially of a cast-iron bell (fig. No. 14), having a base area of a square foot, or 929 square centimeters. A 1¼-inch inlet was provided for the surrounding water to enter, and radiating from this were pipes having one-eighth-inch perforation in the bottoms (fig. No. 15). The outlet, 1½ inches in diameter, was connected to a rubber suction hose, which led to a rotary pump driven by a gasoline engine on deck. When the power pump was started the water from without entered the inlet, stirred up and suspended the top layer of mud confined in the bell, and this suspended matter was brought up through the hose and pumped into a graduated iron tank 2 feet square and 3 feet deep. Pumping was stopped when the water ran clear. A sample of the mixture was collected for analysis and the dilution of the 929 square centimeters of surface mud calculated. At the same time samples of the river water were taken, and from this the net bacterial count of the mud per centimeter of surface deduced. Chemical studies of this mixture were also made. The samples of water collected for bacteriological analysis were also used for the determination of turbidity.

Samples for chlorine determination were dipped up and placed in a hydrometer jar. Samples for plankton studies were collected near the surface in a 5-liter bottle attached to a pole, while deep or composite samples were pumped by a small, manually operated rotary pump through a one-half-inch hose. A cone-shaped iron dredge was used for collecting samples of surface mud in deep water, while in shallow water a shovel-shaped apparatus was used (fig. No. 16).

BACTERIOLOGICAL STUDIES.

The bacteriological data which were relied upon in this investigation as indices of pollution, were the total count of bacteria developing upon certain media and the prevalence of organisms of the *B. coli* group. It is not felt that these indices require defense in the present state of water bacteriology, since it is well understood that these data, in spite of drawbacks which have been urged by various observers, do give us fairly reliable and accurate notions of the sanitary conditions of water. The direct demonstration of the typhoid or other epidemic disease-causing organisms is impracticable, certainly as a routine, and other indices which have been suggested, such as the so-called sewage streptococci have not as yet established their value.

The technic employed conformed to the standard methods of the American Public Health Association. Lactose bouillon in Smith fermentation tubes were used for the detection of gas-forming organisms as a standard procedure. To these tubes, which contained about 25 c. c. of lactose broth, the water to be tested was added in three amounts, which were varied, after some experience, according

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to the card data as to sampling station, tide, turbidity, and other determining factors. The amounts used were such as would most probably give one negative tube—that is, one which contained no gas. The tubes were incubated for 48 hours at 37° and then examined. Record was made on the card as to the amount of gas in the tube. From the highest dilution showing gas, and from the next one above, a loop of the culture was then spread with a loop upon the surface of an endo plate. At the end of 24 hours' incubation at 37° these endo plates were examined and all colonies showing a metallic sheen were considered *B. coli.* If the endo plates were negative, another series was carried on from the tubes, which had been preserved for that purpose, and the first endo plate was also kept for subsequent examination. Several hundred of the typical *B. coli* colonies were carried through a series of confirmatory tests, which are fully discussed later on. Many typhoid-like colonies were picked from the endo plates, but none had all of the cultural and agglutinative characteristics of *B. typhosus.*

Nutrient agar was used for the determination of the total bacterial count and the counts were made after 24 hours' incubation at 37°. Several plates were made of each sample and, always, duplicate plates of the middle dilution in the fermentation tube; for instance, if the amounts 10 c. c., 1 c. c., and 0.1 c. c. were used in the tubes, two plates with 1 c. c. were made, in addition to others if there was doubt as to proper dilution. Such dilution was made as would probably give a total count of approximately 200 or less. When possible the whole number of colonies on each plate were counted and the recorded result is an average of the two plates.

The value of gelatin medium for such purposes as learning the total count in filtration plants and for determining the total changes undergone by bacterial life in a body of water is fully recognized; but where the primary object is to secure an indication of the presence of organisms of intestinal origin, and therefore with an optimum temperature approximating that of the human body, nutrient agar at 37° is considered superior to gelatin at 20°. During the autumn months gelatin was almost useless for the lower-river work, in consequence of the number of liquefying bacteria present in the water. It was decided, in addition to the constant use of lactose broth and nutrient agar, to run a parallel series of lactose bile and gelatin, in order definitely to determine the camparative value of those media in work such as this on the Potomac River.

In another portion of the report will be found the analyses which show the comparative values of lactose broth and lactose bile, and a comparison of the results as interpreted by the so-called presumptive test, and by the confirmatory method with endo and other media used for a complete identification.

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Both Smith and Durham fermentation tubes were used for the culture of gas-forming organisms. During the first few months of the investigation the Smith tubes were used exclusively; accurate observations were made of the percentage of gas formed and many analyses made as to the composition of the gas. In an extensive study, such as the present one, where the variations between different samples from the same stations are marked, it is more important to study the essential factors of as large a number of samples as possible than to expend energy and time upon what are proven to be unimportant and nonessential details. The chief objection raised against the use of the Durham tubes is that it is impracticable to determine accurately the percentage of gas formation.

A study of the results of confirmatory tests of those tubes which gave various percentages of gas showed that the tubes having percentages between 20 and 70 were undoubtedly more apt to contain *B. coli* than either those having the smaller amounts, which were due to the fermentation of muscles sugars by the proteus group, or those having larger percentages, which were almost always caused by a much more important group of lactose-splitting, spore-forming anaerobes, the occurrence and significance of which are fully discussed hereafter. Nevertheless an experience covering the examination of many thousands of fermentation tubes conclusively demonstrated that gas measurement alone is not a sufficiently reliable index to warrant a conclusion as to the identity of the gas-forming organism. Both of the above noncolon groups, however, are excluded by the use of aerobic endo plates, and because of the ease of making this determination and the accuracy of this one confirmatory test as compared to the slow and difficult procedure of confirmation by all the subculture tests, the Durham tube with endo confirmation was adopted, instead of the less accurate presumptive test.

Durham tubes were found to be economical of space, media, and time of inoculating, handling, and cleaning. They are less useful when 10 c. c. or more of water is to be tested. For making dilutions it was found very convenient to have 9 c. c. of water placed in each of many test tubes, which were then plugged with cotton and placed in the autoclave for 30 minutes at 120°. With proper care the quantity remained constant and was checked up frequently.

BACTERIOLOGICAL RESULTS—THE AGAR COUNTS.

The results of the few examinations of the waters of the upper river have already been given. Those of the lower river were very numerous, and will not be given in detail. There are many possible ways of presenting the large mass of data involved, and for purposes of rough orientation a table (12) of monthly averages by cross sections has been prepared. Averages of bacterial counts fail to give information as to that very important feature of successive

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examinations—the variation. Nevertheless, from the table, the pollution resultant upon the entry of wastes from the cities at the upper end of this section of the river and its seasonal variation may be roughly gauged. The variations of results of successive daily, or at least frequent, examinations at a given station are, however, of the utmost importance when we attempt to estimate the sanitary status of a water. Two stations might give results which, when averaged, would be identical and yet be entirely different in character. In one case there might be a uniform moderate contamination and in the other an ordinarily exceptionally pure-water subject to occasional excessive pollution. The treatment of such waters in order to secure suitable supplies for domestic uses would be essentially different in the two cases. Table 13 shows the variation in the individual counts during quarterly periods at the various cross sections or sampling stations. It may be used for more intimate study of these variations as influenced by season and location in the course of the river. This table was prepared by classifying all of the contents in convenient groups, determining the number of counts for each station and quarter of the year falling in each of these groups, and then calculating in each instance what percentage of the total number of counts for that station and season this number represented. The percentages thus obtained are then added successively, beginning with the number of the greatest counts, and the totals entered opposite the appropriate group. Such an arrangement shows, for example, that at the Giesboro Point section during the quarter September to November all (100 per cent) of the counts were over 400, about half (53.4 per cent) were over 4,000, while only a few (3.4 per cent) were over 40,000.

TABLE 12.—*Monthly averages of bacteriological results by cross sections.*

[Cross section. Miles from Washington—nautical miles.]

Month.	Washington sewage, number of thousands of organisms.			Giesboro Point, 2 miles.			Fort Foote, 6 miles.			Fort Washington, 10 miles.		
	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.
1913.												
June	.....	.....	.....	9,500	.....	316	5,700	.....	207	1,700	.....	133
July	.....	.....	.....	10,000	.....	375	7,200	.....	291	1,200	.....	26
August	4,300	3,200	204	12,500	15,500	617	7,800	11,500	313	550	1,400	34
September	6,700	10,300	250	8,300	2,800	306	4,000	4,600	124	550	500	24
October	4,400	5,900	303	12,000	17,500	389	6,300	10,500	348	1,800	1,300	98
November	2,000	3,300	80	6,800	18,000	231	4,400	15,000	242	3,600	8,500	202
December	1,200	7,800	185	4,300	.....	199	5,500	.....	367	3,700	.....	167
1914.												
January	1,200	1,800	39	6,900	.....	184	6,800	.....	255	6,600	.....	385
February	950	.....	66	4,600	.....	24	5,100	.....	370	2,600	.....	200
March	750	1,800	56	2,200	20,500	98	2,500	23,000	125	2,300	22,500	104
April	850	6,000	65	2,300	18,000	86	4,400	49,000	279	4,400	41,000	288
May	1,400	5,200	73	2,300	22,000	199	3,700	45,000	290	2,900	39,500	157

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TABLE 12.—*Monthly averages of bacteriological results by cross sections*—Contd.

Month.	Mount Vernon, 12 miles.			Marshall Hall, 14 miles.			Whitestone Point, 15 miles.			Indianhead, 20 miles.		
	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.
1913.												
June	1,700		94									
July	650		16									
August	400	950	15	325	400	48						
September				275	1,700	24						
October				1,200	2,800	85						
November				2,400	5,700	137						
December				1,900		64	2,500		115	1,600		95
1914.												
January							5,900		253	6,600		214
February							3,300		119	2,800		121
March				2,400	47,500	91	1,700		182	610		89
April					34,500	78	3,600	37,500	267			
May							1,300	37,000	123	660		64

Month.	Possum Point, 24 miles.			Maryland Point, 42 miles.			Popes Creek, 53 miles.			Lower Cedar Point, 57 miles.			Below Lower Cedar Point to Point Lookout, 64 to 102 miles.		
	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.	Agar.	Gelatin.	Colon per c. c. broth.
1913.															
June															
July															
August				85	120	0.04	90	50	0.07				29		0.01
September				75	75	.07	55	90	.06	43	50	0.03	50	62	.03
October				60	120	.11	40	100	.17	39	150	.03	42	176	.03
November	500			100	275	.75	65	170	.29	49	170	.14	21	120	.03
December	2,500		10	60	400	.32	40	220	.14	34	90	.08	24	119	.02
1914.															
January	2,500		117	275	1,300	6.9	140	800	1.2	65	400	.24	32	390	.10
February	2,200		138	450		4.7	50	1,100	.38	48	850	.06	39	509	.14
March	500		36	220	2,500	3.5	100	1,200	.28	62	950	.23	33	439	.04
April				150	750	.20	150	750	.17	110	800	.09	49	353	.04
May	500		10	120	1,100	.25	85	750	.12	85	650	.13	48	450	.07

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TABLE 13.—*Distribution of agar results according to count.*

SEPTEMBER, OCTOBER, AND NOVEMBER, 1913.

Number of organisms per cubic centimeter.	Dalecarlia Inlet.		Three Sisters.		Pennsylvania Railroad Bridge.		Giesboro Point.		Fort Foote.		Fort Washington.		Marshall Hall.		Maryland Point.		Popes Creek.		Lower Cedar Point.		Below Cedar Point.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
0-10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	100.0	2	100.0	4	100.0	131	100.0
10-20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	99.7	22	99.4	23	98.3	359	86.0
20-30	3	100.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22	97.7	56	92.4	69	88.8	194	47.8
30-40	8	95.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32	90.4	57	74.6	53	60.0	72	27.1
40-50	1	85.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	79.9	69	56.8	36	37.9	54	19.4
50-75	6	83.8	1	100.0	.....	.....	.....	.....	.....	.....	.....	.....	2	100.0	89	63.4	64	34.6	39	28.9	58	13.6
75-100	5	75.5	1	98.6	.....	.....	.....	.....	.....	.....	1	100.0	2	99.3	54	34.0	23	7.3	7	6.7	28	7.5
100-125	3	68.9	1	97.3	.....	.....	.....	.....	.....	.....	0	99.7	19	98.6	22	16.1	11	6.7	4	3.7	12	4.5
125-150	4	64.9	1	95.9	.....	.....	.....	.....	.....	.....	4	99.7	.....	.....	9	8.9	2	3.5	1	2.1	4	3.2
150-175	4	59.5	0	94.5	.....	.....	.....	.....	.....	.....	10	98.3	21	91.9	4	5.9	1	2.9	0	1.6	4	2.8
175-200	4	54.0	0	94.5	1	100.0	.....	.....	.....	.....	4	94.8	.....	.....	3	4.6	1	2.5	2	1.6	3	2.3
200-225	6	48.7	2	94.5	0	99.3	.....	.....	.....	.....	5	93.4	34	84.5	1	3.6	0	2.2	0	0.8	3	2.0
225-250	4	40.5	1	91.8	3	99.3	.....	.....	.....	.....	7	91.6	.....	.....	1	3.3	1	2.2	0	0.8	3	1.7
250-300	4	35.1	2	90.4	2	97.3	.....	.....	1	100.0	22	89.2	25	72.5	3	3.0	2	1.9	1	0.8	2	1.4
300-350	3	29.7	1	87.7	2	95.9	.....	.....	0	99.7	13	81.5	14	63.7	1	2.0	0	1.3	0	0.4	2	1.2
350-400	3	25.7	2	86.3	3	94.6	.....	.....	1	99.7	18	77.0	8	58.8	3	1.7	0	1.3	0	0.4	3	1.0
400-450	3	21.6	2	83.6	2	92.5	1	100.0	0	99.3	10	70.7	8	56.0	0	0.7	2	1.3	1	0.4	2	0.6
450-500	1	17.6	1	80.8	4	91.2	0	99.7	0	99.3	14	67.2	9	53.2	0	0.7	0	0.6	.....	.....	1	0.4
500-600	1	16.2	2	79.4	6	88.5	1	99.7	3	99.3	13	62.4	10	50.0	1	0.7	0	0.6	.....	.....	3	0.3
600-700	2	14.9	5	76.7	6	84.5	2	99.3	3	98.3	7	57.8	4	46.5	0	0.3	1	0.6	.....	.....	.....	.....
700-800	2	12.2	4	69.9	7	80.4	3	98.7	4	97.3	9	55.4	4	45.1	1	0.3	1	0.3	.....	.....	.....	.....
800-900	0	9.5	2	64.4	6	75.6	4	97.6	6	95.9	9	52.3	6	43.7	.....	.....	.....	.....	.....	.....	.....	.....
900-1,000	1	9.5	6	61.6	19	71.6	2	96.3	1	93.8	3	49.1	3	41.5	.....	.....	.....	.....	.....	.....	.....	.....
1,000-1,500	3	8.1	9	52.4	18	58.8	13	95.6	19	83.4	15	48.1	8	40.5	.....	.....	.....	.....	.....	.....	.....	.....
1,500-2,000	2	4.1	6	41.1	17	46.6	20	91.2	19	86.9	16	42.7	28	37.7	.....	.....	.....	.....	.....	.....	.....	.....
2,000-2,500	1	1.4	5	32.8	13	35.1	26	84.3	26	80.3	22	37.3	25	27.8	.....	.....	.....	.....	.....	.....	.....	.....
2,500-3,000	.....	.....	4	26.0	11	26.4	25	75.5	27	71.4	14	29.7	13	19.0	.....	.....	.....	.....	.....	.....	.....	.....
3,000-3,500	.....	.....	5	20.5	10	18.9	17	67.0	25	62.1	17	24.7	11	14.4	.....	.....	.....	.....	.....	.....	.....	.....

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TABLE 13.—*Distribution of agar results according to count*—Continued.

SEPTEMBER, OCTOBER, AND NOVEMBER, 1913—Continued.

Number of organisms per cubic centimeter.	Dalecarlia Inlet.		Three Sisters.		Pennsylvania Railroad Bridge.		Giesboro Point.		Fort Foote.		Fort Washington.		Marshall Hall.		Maryland Point.		Popes Creek.		Lower Cedar Point.		Below Cedar Point.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
3,500–4,000	.....	.....	1	13.7	6	12.2	23	61.2	14	53.4	13	18.8	6	10.6	.....	.....	.....	.....	.....	.....	.....	.....
4,000–4,500	.....	.....	1	12.3	2	8.1	18	53.4	23	48.6	9	14.3	8	8.5	.....	.....	.....	.....	.....	.....	.....	.....
4,500–5,000	.....	.....	1	11.0	4	6.8	13	47.3	19	40.7	10	11.1	3	5.6	.....	.....	.....	.....	.....	.....	.....	.....
5,000–6,000	.....	.....	4	9.6	4	4.1	26	42.8	17	34.1	11	7.7	6	4.6	.....	.....	.....	.....	.....	.....	.....	.....
6,000–7,000	.....	.....	1	4.1	2	1.4	14	34.0	24	28.3	5	3.8	3	2.5	.....	.....	.....	.....	.....	.....	.....	.....
7,000–8,000	.....	.....	0	2.7	.....	.....	12	28.3	12	20.0	2	2.1	2	1.4	.....	.....	.....	.....	.....	.....	.....	.....
8,000–9,000	.....	.....	0	2.7	.....	.....	4	25.2	12	15.9	2	1.4	0	0.7	.....	.....	.....	.....	.....	.....	.....	.....
9,000–10,000	.....	.....	1	2.7	.....	.....	9	23.8	9	11.7	2	0.3	1	0.7	.....	.....	.....	.....	.....	.....	.....	.....
10,000–15,000	.....	.....	0	1.4	.....	.....	16	20.8	13	8.5	.....	.....	1	0.4	.....	.....	.....	.....	.....	.....	.....	.....
15,000–20,000	.....	.....	1	1.4	.....	.....	11	15.3	7	4.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20,000–25,000	.....	.....	.....	.....	.....	.....	4	11.6	3	1.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25,000–30,000	.....	.....	.....	.....	.....	.....	3	10.2	1	0.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30,000–35,000	.....	.....	.....	.....	.....	.....	6	3.4	1	0.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
35,000–40,000	.....	.....	.....	.....	.....	.....	6	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
40,000–45,000	.....	.....	.....	.....	.....	.....	4	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
45,000–50,000	.....	.....	.....	.....	.....	.....	1	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
50,000–60,000	.....	.....	.....	.....	.....	.....	6	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
60,000–70,000	.....	.....	.....	.....	.....	.....	1	1.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
70,000–80,000	.....	.....	.....	.....	.....	.....	1	1.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
80,000–90,000	.....	.....	.....	.....	.....	.....	2	0.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Number of samples	74	.....	73	.....	148	.....	294	.....	290	.....	287	.....	284	.....	303	.....	315	.....	240	.....	938	.....

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TABLE 13.—*Distribution of agar results according to count*—Continued.

DECEMBER, 1913, JANUARY AND FEBRUARY, 1914.

Number of organisms per c. c.	Glesboro Point.		Fort Foote.		Fort Washington.		Whitestone Point.		Indianhead.		Possum Point.		Maryland Point.		Popes Creek.		Lower Cedar Point.		Below Lower Cedar Point.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
0–10																			45	100.0
10–20													1	100.0	7	100.0	7	100.0	165	91.8
20–30													16	99.6	23	95.0	25	93.3	131	61.8
30–40													19	90.2	32	80.9	17	69.5	86	38.0
40–50													12	79.2	32	64.8	18	53.3	40	22.4
50–75											1	100.0	19	72.3	29	46.6	20	36.0	53	15.1
75–100											2	99.2	26	61.7	20	30.1	11	17.1	22	5.5
100–125											2	97.6	14	46.2	15	18.8	7	6.7	5	1.5
125–150											4	46.1	8	38.3	6	10.2			0	.55
150–175											3	92.9	10	33.5	2	6.8			0	.55
175–200	1	100.0									3	90.6	6	27.7	1	5.7			0	.55
200–225	0	98.6			2	100.0	2	100.0	1	100.0	2	88.2	6	24.3	2	5.1			1	.55
225–250	0	98.6							1	99.2	2	86.6	5	20.8	0	4.0			0	.36
250–300	0	98.6							1	98.4	3	85.0	3	17.9	0	4.0			2	.36
300–350	0	98.6			0	96.9	0	97.8	0	97.5	6	82.7	3	16.2	0	4.0				
350–400	0	98.6							0	97.5	3	78.0	3	14.5	0	4.0				
400–450	2	98.6			1	96.9	1	97.8	1	97.5	3	75.6	4	12.7	1	4.0				
450–500									2	96.7	3	73.2	1	10.4	0	3.4				
500–600	0	95.8	1	100.0	0	95.3	0	96.7	2	95.1	3	70.9	3	9.8	1	3.4				
600–700	1	95.8	0	98.7					1	93.4	3	68.5	3	8.1	1	2.8				
700–800	3	94.4	0	98.7	0	95.3	2	96.7	1	92.6	3	66.1	2	6.4	2	2.3				
800–900	1	90.2	0	98.7					4	90.7	4	63.8	2	5.2	1	1.1				
900–1,000	2	88.8	0	98.7					3	88.5	2	60.6	0	4.0	1	.6				
1,000–1,500	9	85.9	2	98.7	1	95.3	7	44.5	17	85.0	13	59.1	4	4.0	1	.6				
1,500–2,000	3	73.2	3	96.1	2	93.8	7	86.8	13	71.9	16	48.8	2	1.7						
2,000–2,500	3	69.0	4	92.3	8	90.6	8	79.1	8	61.2	10	36.2	0	.6						
2,500–3,000	6	57.7	4	76.9	7	71.9	5	61.5	7	48.0	2	22.8	1	.6						
3,000–3,500	6	49.3	9	71.8	9	60.9	13	56.0	3	42.1	5	21.3								
3,500–4,000	5	40.8	8	60.2	2	46.9	3	41.7	11	39.7	6	17.3								
4,000–4,500	4	33.8	4	50.0	6	43.7	3	38.4	5	30.6	3	12.6								

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TABLE 13.—*Distribution of agar results according to count*—Continued.

DECEMBER, 1913, JANUARY AND FEBRUARY, 1914—Continued.

Number of organisms per c. c.	Giesboro Point.		Fort Foote.		Fort Washington.		Whitestone Point.		Indianhead.		Possum Point.		Maryland Point.		Popes Creek.		Lower Cedar Point.		Below Lower Cedar Point.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
4,500–5,000	2	28.2	8	44.9	2	34.4	7	35.2	11	26.4	5	10.2	.....	.....	.....	.....	.....	.....	.....	.....
5,000–6,000	3	25.4	5	34.6	4	31.2	6	27.5	6	17.4	4	6.3	.....	.....	.....	.....	.....	.....	.....	.....
6,000–7,000	2	21.1	4	28.2	3	25.0	8	20.9	2	12.4	1	3.1	.....	.....	.....	.....	.....	.....	.....	.....
7,000–8,000	1	18.3	6	23.1	4	20.3	1	12.1	3	10.7	1	2.4	.....	.....	.....	.....	.....	.....	.....	.....
8,000–9,000	1	16.5	5	15.4	3	14.1	2	11.0	2	8.3	2	1.6	.....	.....	.....	.....	.....	.....	.....	.....
9,000–10,000	8	15.5	5	9.0	5	9.4	3	8.8	6	6.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10,000–15,000	3	4.2	2	2.6	1	1.6	4	5.5	1	1.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20,000–25,000	.....	.....	.....	.....	.....	.....	1	1.1	1	.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Number of samples	71	.....	78	.....	64	.....	91	.....	121	.....	127	.....	173	.....	176	.....	105	.....	550	.....

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TABLE 13.—*Distribution of agar results according to count*—Continued.

MARCH, APRIL, AND MAY, 1914.

Number of organisms per c. c.	Giesboro Point.		Fort Foote.		Fort Washington.		Whitestone Point.		Indianhead.		Possum Point.		Maryland Point.		Popes Creek.		Lower Cedar Point.		Below Lower Cedar Point.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
0-1																			10	100.0
10-20															2	100.0	4	100.0	110	98.8
20-30											1	100.0	1	100.0	6	99.2	12	97.2	209	85.5
30-40											1	98.8	1	99.5	29	96.6	30	88.8	136	60.0
40-50									1	100.0	0	97.7	1	98.9	24	84.4	28	67.9	111	43.6
50-75									9	99.1	5	97.7	26	98.4	69	74.2	29	51.7	146	30.2
75-100									4	91.1	3	92.1	32	84.2	28	44.9	14	31.5	55	12.5
100-125					1	100.0			8	87.4	6	88.0	32	66.8	27	33.0	8	21.7	13	5.8
125-150					0	99.3			1	80.2	1	81.8	12	49.4	11	21.6	5	16.1	3	4.2
150-175					0	99.3			3	79.4	5	80.8	17	42.9	14	17.0	5	12.6	5	3.9
175-200					0	99.3			0	76.7	1	75.1	6	33.7	10	11.0	1	9.1	6	3.2
200-225	1	100.0			0	99.3	1	100.0	5	76.7	4	74.0	16	30.5	5	6.4	2	8.4	7	2.5
225-250	0	99.4			0	99.3	0	99.4	4	72.2	3	69.5	3	21.7	0	4.7	2	7.0	1	1.7
250-300	0	99.4			1	99.3	1	99.4	3	68.6	1	66.1	8	20.2	1	4.7	1	5.6	2	1.6
300-350	2	99.4			1	98.6	1	99.0	6	66.0	12	65.0	8	15.8	3	4.2	3	4.9	2	1.3
350-400	3	98.1			1	97.8	0	98.4	6	60.8	9	51.6	4	11.4	0	3.0	2	2.8	2	0.9
400-450	2	95.3			1	97.1	1	98.4	9	55.3	8	41.5	3	9.2	0	3.0	2	1.4	2	0.9
450-500	3	94.8			0	96.4	2	97.9	12	47.3	2	32.5	5	7.6	0	3.0			1	0.6
500-600	12	91.8			1	96.4	5	96.8	11	36.5	4	30.6	3	4.9	0	3.0			2	0.5
600-700	7	85.0	2	100.0	4	95.6	7	94.2	6	26.8	7	25.8	2	3.3	1	3.0			0	0.2
700-800	16	80.4	1	98.7	7	92.7	4	90.2	5	21.4	3	17.9	2	2.2	2	2.5			0	0.2
800-900	10	70.6	2	98.2	4	87.5	8	88.4	3	19.0	3	14.6	0	1.1	1	1.7			2	0.2
900-1,000	5	63.4	2	97.8	4	84.6	14	84.2	1	14.3	2	11.2	0	1.1	0	1.3				
1,000-1,500	25	60.1	23	95.6	12	81.6	42	76.9	8	13.4	5	9.0	1	1.1	1	1.3				
1,500-2,000	14	43.8	21	81.2	11	72.8	25	54.5	4	6.2	2	3.4	0	0.5	2	0.9				
2,000-2,500	8	34.6	16	68.1	9	64.7	23	41.3	0	2.7	0	1.1	1	0.5						
2,500-3,000	6	29.5	23	58.2	17	58.0	15	29.1	0	2.7	0	1.1								
3,000-3,500	5	25.5	9	43.7	12	45.5	15	21.2	0	2.7	1	1.1								
3,500-4,000	4	22.2	7	38.2	14	36.8	2	13.2	0	2.7										
4,000-4,500	6	19.6	9	33.7	3	26.9	2	12.2	0	2.7										

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TABLE 13.—*Distribution of agar results according to count*—Continued.

MARCH, APRIL, AND MAY, 1914—Continued.

Number of organisms per c. c.	Glesboro Point.		Fort Foote.		Fort Washington.		Whitestone Point.		Indianhead.		Possum Point.		Maryland Point.		Popes Creek.		Lower Cedar Point.		Below Lower Cedar Point.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
4,500–5,000	6	15.7	13	28.2	7	24.5	7	11.1	0	2.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,000–6,000	5	11.7	7	20.0	7	19.1	2	7.4	1	2.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6,000–7,000	3	8.5	4	15.6	6	14.0	3	6.3	0	1.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7,000–8,000	2	6.5	8	13.1	3	9.5	1	4.8	2	1.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8,000–9,000	4	5.2	3	8.1	0	7.4	1	4.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9,000–10,000	2	2.6	3	6.3	3	7.4	2	3.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10,000–15,000	1	1.3	4	4.4	5	5.1	5	2.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15,000–20,000	1	0.7	2	1.9	0	1.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20,000–25,000	.....	.....	1	0.6	2	1.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Number of samples	153	.....	160	.....	136	.....	189	.....	112	.....	89	.....	184	.....	236	.....	143	.....	825	.....

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TABLE 13.—*Distribution of agar results according to count*—Continued.

JUNE, JULY, AND AUGUST, 1914.

Number of organisms per c.c.	Dalecarlia Inlet.		Three Sisters.		Pennsylvania Railroad Bridge.		Glesboro Point.		Fort Foote.		Fort Washington.		Mount Vernon.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
0–10	6	100.0												
10–20	12	92.1												
20–30	16	76.3												
30–40	6	55.3												
40–50	12	47.4	1	100.0									1	100.0
50–75	3	31.6	0	97.6									1	99.5
75–100	2	27.6	2	97.6	1	100.0					1	100.0	7	99.1
100–125	2	25.0	1	92.7	0	99.1					0	99.6	5	95.9
125–150	2	22.4	1	90.3	0	99.1					1	99.6	7	92.6
150–175	2	19.7	1	87.8	0	99.1	1	100.0			1	99.1	11	90.4
175–200	2	17.1	2	85.4	0	99.1	0	99.5	1	100.0	6	98.7	5	85.5
200–225	2	14.5	1	80.5	0	99.1	0	99.5	0	99.5	3	98.1	7	83.2
225–250	2	11.8	4	78.0	1	99.1	0	99.5	0	99.5	12	94.9	24	80.0
250–300	1	9.2	3	68.3	0	98.2	0	99.5	0	99.5	24	89.7	17	69.1
300–350	0	7.9	4	58.5	2	98.2	0	99.5	0	99.5	25	79.4	13	61.4
350–400	0	7.9	4	51.2	0	96.4	0	99.5	0	99.5	9	68.7	16	55.4
400–450	0	7.9	2	41.5	1	96.4	2	99.5	1	99.5	9	64.8	3	48.2
450–500	3	7.9	2	36.6	1	95.5	2	98.6	3	99.1	19	60.9	16	46.8
500–600	0	3.9	1	31.7	1	94.6	2	97.6	5	97.6	18	52.8	14	30.5
600–700	0	3.9	3	29.3	3	93.7	4	96.6	8	95.3	10	45.1	7	33.2
700–800	1	3.9	0	21.9	2	91.0	0	94.7	5	91.5	11	40.8	6	30.0
800–900	0	2.6	2	21.9	1	88.2	1	94.7	8	89.2	7	36.0	8	27.3
900–1,000	2	2.6	2	17.1	18	87.3	17	94.2	24	85.4	28	33.0	21	23.6
1,000–1,500			0	12.2	7	72.1	7	85.9	10	74.2	15	21.0	11	14.1
1,500–2,000			2	12.2	12	65.8	12	82.5	16	69.5	10	14.6	6	9.1
2,000–2,500			2	7.3	7	55.0	8	76.7	10	62.0	11	10.3	5	6.4
2,500–3,000			0	2.4	4	48.6	9	72.8	7	57.3	4	5.6	2	4.1
3,000–3,500			0	2.4	4	45.1	9	68.4	10	54.0	1	3.9	1	3.2
3,500–4,000			0	2.4	8	41.4	3	64.1	7	49.3	3	3.4	0	2.7
4,000–4,500			0	2.4	2	34.2	1	62.4	9	46.0	1	2.1	1	2.7
4,500–5,000			0	2.4	6	32.4	13	62.1	9	41.8	1	1.7	2	2.3
5,000–6,000			0	2.4	6	27.0	9	55.8	12	37.6	1	1.3	2	1.4
6,000–7,000			0	2.4	2	21.6	9	51.4	10	31.9	2	0.9	0	0.5

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TABLE 13.—*Distribution of agar results according to count*—Continued.

JUNE, JULY, AND AUGUST, 1914—Continued.

Number of organisms per c.c.	Dalecarlia Inlet.		Three Sisters.		Pennsylvania Railroad Bridge.		Giesboro Point.		Fort Foote.		Fort Washington.		Mount Vernon.	
	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.	Number in group.	Per cent greater than lowest group.
7,000–8,000	.....	.....	0	2.4	4	19.8	14	47.1	6	27.2	.....	.....	1	0.5
8,000–9,000	.....	.....	0	2.4	4	16.2	4	40.3	7	24.4	.....	.....	.....	.....
9,000–10,000	.....	.....	1	2.4	5	12.6	36	38.3	24	21.1	.....	.....	.....	.....
10,000–15,000	.....	.....	.....	.....	3	8.1	19	20.8	7	9.9	.....	.....	.....	.....
15,000–20,000	.....	.....	.....	.....	2	5.4	6	11.7	4	6.6	.....	.....	.....	.....
20,000–25,000	.....	.....	.....	.....	2	3.6	5	8.7	3	4.7	.....	.....	.....	.....
25,000–30,000	.....	.....	.....	.....	1	1.8	3	6.3	2	3.3	.....	.....	.....	.....
30,000–35,000	.....	.....	.....	.....	0	0.9	4	4.9	2	2.3	.....	.....	.....	.....
35,000–40,000	.....	.....	.....	.....	0	0.9	1	2.9	1	1.4	.....	.....	.....	.....
40,000–45,000	.....	.....	.....	.....	1	0.9	0	2.4	0	1.0	.....	.....	.....	.....
45,000–50,000	.....	.....	.....	.....	.....	.....	1	2.4	1	1.0	.....	.....	.....	.....
50,000–60,000	.....	.....	.....	.....	.....	.....	1	1.9	0	0.5	.....	.....	.....	.....
60,000–70,000	.....	.....	.....	.....	.....	.....	1	1.5	0	0.5	.....	.....	.....	.....
80,000–90,000	.....	.....	.....	.....	.....	.....	2	1.0	1	0.5	.....	.....	.....	.....
Number of samples	76	.....	41	.....	111	.....	206	.....	213	.....	233	.....	220	.....

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A graphic method of showing the variation in the numbers enecountered at each station is given in charts E, F, G, and H. Here the counts for stations and periods, as in Table 13, have been similarly arranged in groups and then plotted in curves on a logarithmic scale, which enables the high counts to be included in convenient space. In these charts the more nearly vertical the curves run the less the variation in the counts for a given station will be, and the more nearly the curves are parallel to each other the more nearly does the type of variation at the different stations conform. Since the intensity of pollution is indicated in these charts by the distance from the left-hand margin which a given curve occupies, the pollution introduced near Giesboro Point to the water as it comes downstream from Three Sisters, and the progressive purification taking place as one proceeds down the river, can be readily appreciated. Since the area between the curves corresponds to the drop in the number of bacteria, it is evident that the water is considerably purified in the area between the sewer outlet and Mount Vernon. During the next three months there is a change in the form of the curves for Fort Washington and Mount Vernon. They become compound curves, showing along the upper half of their length a tendency to repeat the form of the preceding three months, but shifting at the lower end to a position comparable to the next three months of high-stream flow.

The river is thus seen to change from a summer phase to a wet, winter phase. During the next three months this movement becomes general. Stations as far down the river as Indianhead, which during the summer months showed a very considerable purification over the condition at Fort Washington, become during December, January, and February almost as bad as the up-river stations. Indeed, the curve of Possum Point advances to a position beyond that held previously by Fort Washington. As in the case of the decrease in the number of *B. coli* already discussed, this is due to, and almost wholly explained by, the high-stream flow and the shortened time required for the water to reach these stations. The first effects are noticed at Maryland Point, and even the other lower-river stations, where the curves begin to swing or skew toward the higher counts. During March, April, and May the upper-river stations show a progressive return to summer conditions. The lower stations, however, due to lag, show the full effects of the wave of rapid flow. The curves at these places round out to a normal form of the worst condition of the water, the upper part of the curve advancing to a true proportion with the lower part. These curves thus describe the continuous wavelike progression of the changing movement of the water and the changing condition of the water due to the change in time. The averages of the agar counts follow the formula developed for the

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B. coli results and show that they also may be explained to a large extent by the time factor.

The agar counts compared to the colon determinations.—The colon averages given in this report are calculated from the fermentation tube results according to the method proposed by Phelps—a method which, if susceptible of error like all proposed procedures, nevertheless gives us the most practicable and reliable means of expressing the results based on a large bulk of data. To quote Phelps:

> The principle upon which this method of calculation is based is this: If a series of dilutions are made from a given water and these dilutions submitted to appropriate tests, giving positive or negative results, the most probable value of the actual numbers of organisms present is indicated by the reciprocal of the greatest dilution giving a positive test. For example, if dilutions of 0.1, .01, and .001 c. c. are investigated, and a positive result obtained on the first two and not on the last, the most probable number of bacteria present in the water is 100.

In the present investigation the colon averages based on figures thus calculated have borne an astonishingly constant relation to the agar counts for the same sampling stations. In Table 14 these ratios are presented, and they show that for all stations down to Maryland Point the relation of *B. coli* to the total agar count is about 5 to 100. Below this point the number of *B. coli* becomes so small that the ratio is distinctly changed. At Maryland Point the river commences to be distinctly salt, and the contamination in these lower areas is so slight that local chance pollutions may readily sway the results and cause the observed irregularities.

TABLE 14.—*Number of B. coli to each 100 colonies on agar 37°, by months and cross sections.*

Cross section.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.
Sewage	.....	.....	4.75	3.73	6.89	4.00	15.42	3.25	6.95	7.65	7.64	5.21
Glesboro Point	3.36	3.75	4.94	3.69	3.25	3.40	4.63	2.67	.52	4.45	3.74	3.66
Fort Foote	3.63	4.05	4.01	3.10	5.52	5.50	6.56	3.75	7.23	5.00	6.34	3.66
Fort Washington	7.65	2.17	6.18	4.37	5.44	5.58	4.51	5.83	7.69	4.52	6.54	5.41
Mount Vernon	5.53	2.46	3.75	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marshall Hall	1.48	8.73	7.08	5.71	3.37	.....	.....	.....	.....	3.79	.....	.....
White Point	.....	.....	.....	.....	.....	.....	4.60	4.36	3.58	1.07	7.42	2.46
Indianhead	.....	.....	.....	.....	.....	.....	5.94	3.24	4.32	1.46	.....	2.70
Possum Point	.....	.....	.....	.....	.....	.....	2.00	4.68	6.27	7.20	.....	2.00
Average	4.33	4.25	5.12	4.12	4.89	4.62	6.22	3.97	5.22	4.39	6.34	6.89
Maryland Point	.....	.....	.047	.093	.183	.750	.530	2.51	1.05	1.52	.133	.218
Popes Creek	.....	.....	.078	.109	.425	.447	.350	.857	.760	.280	.113	.141
Lower Cedar Point	.....	.....	.....	.069	.076	.290	.235	.369	.125	.371	.062	.135
Below Lower Cedar Point	.....	.....	.335	.060	.072	.143	.083	.313	.359	.121	.062	.146
Average below Possum Point	.....	.....	.052	.081	.189	.239	.300	1.01	.574	.573	.103	.165

General average of sections above Maryland Point for the year. 5.070; general average of sections below Maryland Point for the year, 0.338.

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Sufficient bacteriological evidence has now been presented so that the degree of pollution of the lower river can be appreciated. From this point onward the separate consideration of the pollution and the purification of the stream is scarcely feasible. Reference is therefore made to the section on "Purification," for a continuation of the subject. Before leaving the subject of bacteriology, however, it seems pertinent to insert at this point certain observations on methods and their results, which were made during the investigation.

ASSOCIATED BACTERIOLOGICAL OBSERVATIONS.

Observations on gas-producing, spore-forming anærobes.—It was early observed that there was a difference in the significance of gas-formation in lactose broth fermentation tubes, according to whether this was found in the water from near the upper portion of the lower river or from the lower stations. Gas in fermentation tubes from the vicinity of Washington was nearly always confirmed as indicating the presence of *B. coli*, by giving a positive reaction on endo medium, whereas in the lower part of the river where larger amounts of water had to be used to secure fermentation, such confirmation failed in the great majority of cases. Suspected differences in the methods used were eliminated by having the same person perform the work, using identical media, the results remaining as before. Plates made at the lower stations from tubes showing gas frequently developed no growth whatever, or if colonies developed they were usually of bacteria of the subtilis group. This indicated that there was present some organism splitting lactose in the fermentation tube which would not even grow on the endo plate. The discrepancy in the results at the upper and lower stations is given in Table 15 and graphically shown in Chart F.

TABLE 15.—*Gas-forming organisms from various stations confirmed or not as being B. coli.*

Cross sections.	Number of samples.	Average number of B. coli per c. c.	Average number of gas formers, not B. coli, per c. c.	B. coli, percentage of total gas formers.
Giesboro Point	770	295	24.1	92.4
Fort Foote	789	254	9.7	96.3
Fort Washington	778	123	6.2	95.2
Mount Vernon to Whitestone Point	851	102	8.5	92.3
Indianhead	241	123	15.7	88.6
Possum Point	212	66.2	13.8	82.7
Maryland Point	691	1.44	.75	65.7
Popes Creek	740	.19	.33	36.5
Lower Cedar Point	476	.14	.16	46.6
Below Lower Cedar Point	2,261	.052	.057	47.5

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The almost parallel diminution in the number of *B. coli* and the percentage of confirmed fermented tubes is discussed in the section comparing lactose bile and lactose broth results, where it becomes evident that another organism besides *B. coli* so affects the presumptive test in both of these media as to render it very unreliable except in the highly polluted parts of the river.

A microscopic examination of the tubes which gave no growth on the endo agar showed large, plump, nonmotile bacteria. When inoculated into another tube these organisms always produced gas, and usually in large amounts. Indeed, a rather consistent characteristic was their pronounced gas formation from 50 to 100 per cent. They also gave vigorous gas formation when inoculated into plain agar tubes by the stab method.

These facts indicate that the organism found at the lower-river stations, which caused gas formation and failed to grow on the plates, must belong to the large group of anaerobes, such as *B. welchii*, *aërogenes capsulatus*, *enteritidis sporogenes*, etc., which have been isolated in many cases from water and soil. Many of these organisms form spores, which would explain their persistence in the water of the lower river. To confirm this conclusion many samples of river water, sewage, and feces were heated for 10 minutes at 80°, and then inoculated in freshly sterilized lactose broth. The river water showed gas in from 1 to 5 c. c., sewage usually in 0.01 c. c., while fresh feces varied, seldom giving it in 0.001 c. c., but usually in quantities less than 0.1 c. c. Vigorous fermentation was characteristic, though plating yielded no *B. coli*, nor would it be expected after this treatment. About 1 c. c. of these broth cultures was inoculated into the ears of several rabbits, which were killed shortly after and incubated at 37° according to the technique described by Welch. After 24 hours they showed a typical appearance, being distended to an enormous size, the blood being forced from the nose by the gas pressure, and the skin filled with gas. On post mortem they showed the typical gas-blown liver, and the veins were bloodless and filled with gas. Cultures from the heart readily fermented lactose broth and plain agar "shake" tubes. Under the microscope the organism showed large nonmotile bacteria varying in length and as regards chain formation.

These results proved beyond reasonable doubt that the bacteria which were fermenting such a large number of tubes at the lower-river stations belonged to a general group of lactose-fermenting anaerobes, most of which form spores. The frequency with which the tubes indicated the presence of these forms makes evident the importance of knowing their source, distribution, and significance. Many advocates of the presumptive test maintain that they are of sewage origin, and therefore have the same significance as *B. coli*,

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and that they should be included with them in interpreting an analysis. But even if they do come from sewage (and it has not been proved that this is the only source) it still does not necessarily follow that they have the same significance as *B. coli*. A different life history, and in particular the fact that they form spores certainly would make it impossible to give the same interpretation to the condition of a water containing these organisms only as to one in which *B. coli* are also present.

While the latter die out rapidly in a river, the spores of the anaerobes persist for long periods and distances; hence they may indicate pollution so remote as to be no longer dangerous. In order to study the occurrence of this important group, a simple technique was employed for separating from them the nonspore forming *B. coli* group. Durham tubes, which had been steamed for half an hour, to expel any traces of free oxygen, were kept in a bath at a constant temperature of 70° (fig. 17). The water tested was then put into these hot tubes and kept at this temperature for 10 minutes, then removed and incubated at 37° until gas formed. Ordinarily 18 hours was the interval before gas appeared, though sometimes 3 or 4 days elapsed before its appearance, and for this reason all tubes were incubated 4 days before calling them negative. The longer time necessary for the first appearance of gas from such spore-bearing organisms is rather strikingly different from that required for *B. coli*, for the latter is usually fermenting vigorously in 12 hours. After gas begins to appear in the former, however, it is formed very rapidly, so that in a few hours the closed arm is usually full of gas, or nearly so.

Such tubes as showed gas after the above treatment were promptly plated upon endo, but the plates in every case showed no growth, or had the wrinkled scum of a subtilis-like growth.

The following is a tabulation of the results obtained by the above-described procedure:

TABLE 16.—*Results of tests for lactose-fermenting, spore-forming anaerodes, 1915.*

Place and date.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Average number per cubic centimeter.	Station average.
Lower Cedar Point:								
Mar. 22	10	+	5	−	1	−	0.1	0.05
Mar. 24	1	+	1	+	1	−	.66	
Mar. 25	1	+	1	+	1	−	.66	
Popes Creek:								
Mar. 22c	5	+	2	+	1	+	1 +	1
Mar. 22d	5	+	2	+	1	−	.5	
Mar. 24	1	+	1	+	1	+	1 +	
Mar. 25	1	+	1	+	1	+	1 +	
Mar. 28	1	+	1	+	1	−	.66	

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TABLE 16.—*Results of tests for lactose-fermenting, spore-forming anaerobes, 1915*—Continued.

Place and date.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Average number per cubic centimeter.	Station average.
Maryland Point:								
Mar. 22	5	+	2	+	1	−	0.5	
Mar. 24	1	+	1	+	1	+	1 +	
Mar. 24	1	+	1	+	1	+	1 +	1
Mar. 25	1	+	1	+	1	+	1 +	
Mar. 28	1	+	1	−	1	+	.66	
Sandy Point:								
Mar. 28	1	+	1	+	1	−	.66	.66
Possum Point:								
Mar. 22	1	+	1	+	1	+	1 +	
Mar. 24	1	+	1	+	1	+	1 +	1
Mar. 25	1	+	1	+	1	+	1 +	
Mar. 28	1	+	1	+	1	−	.66	
Indian Head:								
Mar. 22	1	+	1	−	1	−	.33	
Mar. 22	1	+	1	+	1	−	.66	
Mar. 24	1	+	1	+	1	+	1	.6
Mar. 25	1	+	1	−	1	−	.33	
Mar. 28	1	+	1	+	1	−	.66	
Whitestone Point:								
Mar. 24	1	+	1	+	1	−	.66	
Mar. 25	1	+	1	−	1	−	.33	.56
Mar. 28	1	+	1	+	1	−	.66	
Marshall Hall:								
Mar. 19	1	+	1	+	1	−	.66	
Mar. 20	½	+	½	+	½	+	2 +	
Mar. 23	½	+	½	+	½	−	1.33	
Mar. 25	½	+	½	+	½	+	2 +	.66
Mar. 28	½	−	½	−	½	−	.66—	
Mar. 31	½	+	½	+	½	−	1.33	
Apr. 2	½	+	½	+			2 +	
Apr. 3	½	+	½	+	½	+	2 +	
Fort Washington:								
Mar. 19	1	+	1	+	½	+	1 +	
Mar. 20	½	+	½	+	½	−	1.33	
Mar. 23	½	+	½	+	½	+	2 +	
Mar. 25	½	+	½	−	½	−	.66	1.4
Mar. 30	½	+	½	+	½	−	1.33	
Mar. 31	½	+	½	+	½	−	1.33	
Apr. 2	½	+	½	+			2 +	
Do	½	+	½	+	½	−	1.33	
Fort Foote:								
Mar. 19	1	+	1	+	1	+	1 +	
Mar. 20	½	+	½	+	½	−	1.33	
Mar. 23	½	+	½	+	½	−	1.33	
Mar. 25	½	+	½	+	½	+	2 +	1.5
Mar. 30	½	+	½	+	½	+	2 +	
Mar. 31	½	+	½	−	½	−	.66	
Apr. 2	½	+	½	+			2 +	
Apr. 3	½	+	½	+	½	−	1.33	
Glasboro Point:								
Mar. 19	1	+	1	+	1	+	1 +	
Mar. 20	½	+	½	−	½	−	.66	
Mar. 23	½	+	½	+	½	+	1.33	
Mar. 25	½	+	½	−	½	−	.66	.8
Mar. 30	½	+	½	+	½	−	1.33	
Mar. 31	½	−	½	−	½	−	.66—	
Apr. 2	½	+	½	−	½		1	
Apr. 3	½	+	½	−	½	−	.66	
Red buoy above Anacostia River:								
Mar. 19	1	+	1	−	1	−	.66	
Mar. 20	½	+	½	+	½	+	2 +	
Mar. 23	½	+	½	+	½	+	2 +	
Mar. 25	½	+	½	+	½	+	2 +	1.4
Mar. 30	½	+	½	+	½	−	1.33	
Mar. 31	½	+	½	−	½	−	.66	
Apr. 2	½	+	½	−			1	
Apr. 3	½	+	½	+	½	−	1.33	

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TABLE 16.—*Results of tests for lactose-fermenting, spore-forming anaerobes, 1915*—Continued.

Place and date.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Average number per cubic centimeter.	Station average.
Red buoy above railroad bridge:								
Mar. 19	1	+	1	+	1	−	0.66	
Mar. 20	½	+	½	+	½	+	2 +	
Mar. 23	½	+	½	+	½	−	1.33	
Mar. 25	½	+	½	+	½	−	1.33	1.3
Mar. 30	½	+	½	+	½	−	1.33	
Mar. 31	½	+	½	+	½	−	1.33	
Apr. 2	½	+	½	−			1	
Apr. 3	½	+	½	+	½	−	1.33	
Seventeenth and D Streets:								
Mar. 19	1	+	1	+	1	+	1 +	
Mar. 20	½	+	½	−	½	−	.66	
Mar. 23	½	+	½	+	½	−	1.33	
Mar. 25	½	+	½	+	½	−	1.33	1.1
Mar. 30	½	+	½	+	½	−	1.33	
Mar. 31	½	+	½	+	½	−	1.33	
Apr. 2	½	+	½	−			1	
Apr. 3	½	+	½	−	½	−	.66	
Three Sisters:								
Mar. 19	1	+	1	+	1	−	.66	
Mar. 23	½	+	½	+	½	+	2 +	
Mar. 25	½	+	½	+	½	−	1.33	
Mar. 30	½	+	½	+	½	−	1.33	1
Mar. 31	½	+	½	−	½	−	.66	
Apr. 2	½	+	½	−			1	
Apr. 3	½	+	½	+	½	+	1.33	
Rock Creek at mouth:								
Mar. 19 U	1	+	1	+	1	+	1 +	1 +
Mar. 19 V	1	+	1	+	1	+	1 +	
Rock Creek above Chevy Chase Branch:								
May 8	1	+	1	+	1	+	1 +	.....
Rock Creek below Chevy Chase Branch:								
May 8	1	+	1	+	1	+	1 +	.....
Rock Creek north end Rock Creek Park:								
May 8	1	+	1	+	1	+	1 +	.....
Chevy Chase Branch at Rock Creek:								
May 8	1	+	1	+	1	+	1 +	.....
Falls Branch at Wisconsin Avenue:								
May 8	1	+	1	+	1	+	1 +	.....
Anacostia River at Bennings Branch:								
May 8	1	+	1	+	1	+	1	.....
Potomac at Harpers Ferry:								
May 5	5	+	3	+	2	+	.5 +	
Do	5	+	3	+	2	−	.5 −	
May 6	5	+	3	−	2	−	.3 −	.5
Do	5	+	3	+	2	+	.5 +	
Do	5	+	3	+	2	+	.5 +	
Do	5	+	3	+	2	−	.5 −	
Shenandoah at Harpers Ferry:								
May 5	5	+	3	+	2	+	.5 +	
Do	5	+	3	+	2	+	.5 +	
Do	5	+	3	+	2	−	.5 −	
May 6	5	+	3	−	2	−	.3 −	.5
Do	5	+	3	−	2	−	.3 −	
Do	5	+	3	+	2	+	.5 +	
Do	5	+	3	+	2	+	.5 +	
Canal at Harpers Ferry:								
May 5	5	+	3	−	2	−	.5 −	.4
Potomac at Bridge below Magnolia:								
May 6	5	+	3	+	2	−	.5 −	.5
Potomac, bridge at Magnolia:								
May 4	5	+	3	+	2	−	.5 −	.....
Potomac, bridge above Magnolia:								
May 4	5	+	3	+	2	+	.5 +	.....
Little Cacapon Creek:								
May 4	5	+	3	+	2	+	.5 +	.....
South Branch of Potomac above North Branch:								
May 4	5	+	3	−	2	+	.5	.....

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TABLE 16.—*Results of tests for lactose-fermenting, spore-forming anaerobes, 1915*—Continued.

Place and date.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Cubic centimeters tested.	Gas.	Average number per cubic centimeter.	Station average.
North Branch of Potomac above South Branch:								
May 4	5	+	3	+	2	+	0.5 +	.....
Potomac below Piedmont:								
Apr. 11	1	+	1	−	1	−	.33	0.33
Potomac above pulp mill at Luke:								
Apr. 11	1	−	1	−	1	−	.33−	.....
Georges Creek above bridge at Potomac:								
Apr. 11	1	+	1	+	1	−	.66	.66
SEWAGE.								
Mar. 19	0.1	+	0.1	+	0.1	+	10+	55
Mar. 20	.05	+	.05	+	.05	+	20+	.....
Do	.05	+	.05	+	.05	+	20+	.....
Mar. 24	.05	+	.05	+	.05	+	20+	.....
Do	.05	+	.05	+	.05	+	20+	.....
Mar. 25	.05	+	.05	+	.05	+	20+	.....
Do	.05	+	.05	+	.05	+	20+	.....
Mar. 28	.01	+	.01	+	.01	+	100+	.....
Do	.01	+	.01	+	.01	+	100+	.....
Mar. 30	.01	+	.01	+	.01	+	100+	.....
Do	.01	+	.01	+	.01	+	100+	.....
Mar. 31	.01	+	.01	+	.01	+	100+	.....
Do	.01	+	.01	+	.01	−	66+	.....
Apr. 2	.01	+	.01	+	.01	−	66	.....
May 8	.001	−	.001	−	.001	−	100	.....
Do	.001	−	.001	−	.001	−	100+	.....
CANAL MUD, CUMBERLAND.								
Apr. 22	0.0001	+	0.0001	+	0.0001	+	100000	500000
Apr. 27	.00001	+	.00001	+	.00001	−	1000000	.....
LAKE GORDON WATER.								
Apr. 23	10	+	1	+	1	−	1	1
May 7	10	+	1	+	.1	−	1	.....

Altogether nearly 150 samples were collected from about 40 sources and 3 or more tubes made on each sample. These sources range from sewage and mud to water with varying degrees of pollution, including filtered and treated water. The number of spores in the river water determined by this method is remarkably constant. Unlike *B. coli*, which varies many thousand per cent, from several hundred per c. c. to less than 1 in 10 c. c., according to the intensity of pollution, these spores were found often in the best river water in 10 c. c. and seldom showed an average much above 4 or 5 per c. c. The averages at stations between Lower Cedar Point and Washington, representing water exceedingly pure and water highly polluted, are plotted in Charts E and F, and they show comparatively little difference. Their number furnishes no clue in this case to the degree of pollution and purification, as does the number of *B. coli*.

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The results from other parts of the river are of a similar nature. Spores of gas-forming organisms are found in from 1 to 5 c. c. of water taken at points extending almost to the headwaters of the Potomac. Lake Gordon, formed by damming Evitts Creek, which flows through a comparatively uninhabited watershed, shows these organisms ordinarily in 1 c. c. This lake is used as the water supply of Cumberland, and even after treatment with hypochlorite and filtering the water still contains these organisms in 10 c. c. It would seem from these tests, which cover a large territory and consistently show these spores in from 1 c. c. to 10 c. c., and do not vary with the condition of the water to any considerable extent, that their significance can not be the same as *B. coli.*

The generally uniform distribution of organisms of this group in surface waters, even in those not highly contaminated with sewage and with no considerable increase in polluted waters, indicates that this group is not, as has sometimes been supposed, an organism characteristic of the intestine. Though found in proportion similar to that of the hay-bacillus group in feces, this means, probably, as in the latter case, that it may grow there as well as in other places. It is an organism similar to *B. subtilis* in many respects, except that it is anaerobic. Indeed, certain members of the group are known to live in large numbers in soil. It appears likely, therefore, that it can develop in any oxygen-free material rich in organic matter. Tests on sewage show the spores to the number of less than 100 per c. c.—a thousand fold fewer than the number of the characteristic form *B. coli.* Tests on the digested sewage sludge, constituting the mud at the head basins of the Chesapeake & Ohio Canal, on the other hand, show about 500,000 per c. c. The rich putrefying mud in this case seems to furnish a natural habitat for their growth. These organisms are also found in mud from oyster beds on the ocean side of Fishermans Island, Va.

These observations are in complete accord with work reported elsewhere. Houston, in England, accurately described the same phenomena; Savage summarizes a large number of results by different workers demonstrating the general distribution of the anaerobic spore-forming group. Besides being found in feces, sewage, and water, it has been isolated from foodstuffs, such as wheat, oats, rice, oatmeal, and wheat flour, milk, grains and seeds, salted cod, canned foods, oysters, as well as from road dust, etc. Savage says:

> The evidence available shows that it is absent, or relatively absent, from sources which have never been contaminated, but that it is fairly prevalent in sources the pollution of which had taken place even at a long antecedent period.

The important bearing of these facts on the presumptive test must be apparent. A fairly small uniform distribution of the spores in a water receiving large amounts of sewage and subsequently purify-

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ing itself would give just the effect shown on Chart E. Where the number of *B. coli* is large compared with the anaerobes the latter are lost in the high dilutions necessary to determine the gas formers present, consequently all the tubes show *B. coli* and the presumptive test is efficient. Where the number of *B. coli* diminishes, but the spores persist, the proportions become more nearly the same, and the gas which some of the tubes show is due to anaerobes which will not grow on an aerobic endoplate. Just at those places where the water seems to be on the border between a good and doubtful water the presumptive test fails, for the spores alone indicate merely remote pollution. This effect has been very strikingly shown in the report of the International Joint Commission on the Pollution of Boundary Waters, where large areas of lake water have been polluted locally and most of the *B. coli* have died out. (Table 17.)

The increasing use of hypochlorite for disinfecting water supplies has brought up the same question. Waters which previous to disinfection show *B. coli* consistently in small amounts, also show gas in 1 c. c. to 10 c. c. after disinfection. It is relatively easy to kill the *B. coli* in the water, but to kill the spores would require an excessive amount of chlorine. The organisms have been reported from water at Grand Forks, N. Dak., after treatment, at Cumberland, Md., at Baltimore, Md., and undoubtedly have been noticed in many other places where hypochlorite is used.

TABLE 17.—*Gas producers, St. Johns River.*[1]

Sampling point No.	Number of samples taken.	Average per 100 c. c. by Phelps method.			Sampling point No.	Number of samples taken.	Average per 100 c. c. by Phelps method.		
		Total gas producers.	Typical B. coli.	Anaerobic gas producers.			Total gas producers.	Typical B. coli.	Anaerobic gas producers.
1	21	467	65	402	17	21	476	31	445
2	21	647	160	487	18	21	480	117	363
3	21	566	70	496	19	21	467	117	350
4	20	472	167	305	20	21	600	155	445
5	21	536	160	376	21	21	520	103	417
6	21	643	112	531	22	21	566	112	454
7	21	515	155	360	23	21	1,086	725	361
8	21	730	250	480	24	21	695	202	493
9	21	433	18	415	25	21	614	112	502
10	21	433	112	321	26	21	601	117	484
11	21	519	57	462	27	21	524	57	467
12	21	600	61	539	28	20	540	254	286
13	21	519	74	445	29	21	1,090	631	359
14	21	561	103	458	30	20	476	112	364
15	21	566	164	402	31	21	480	112	364
16	21	604	155	449	32	21	528	70	458

[1] Progress Report of the International Joint Commission in re The Pollution of Boundary Waters.

The following table by George T. Palmer, taken from the report on the water supply of Trenton, N. J., indicates the same condition after treatment, where only the presumptive test was used.

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Sample.	River.		Reservoir.			
			Inlet.		Outlet.	
	Number of tubes.	Per cent positive.	Number of tubes.	Per cent positive	Number of tubes.	Per cent positive.
c. c.						
0.01	60	13	.....	.....	.....	.....
0.1	64	61	5	0	5	20
1.0	64	98	33	3	27	11
5.0	.....	.....	125	33	117	22
10.0	.....	.....	5	60	5	80

TABLE 18.

In his investigation of drinking waters on trains Dr. Creel, of this service, found a large percentage of the waters containing this organism in 1 c. c. to 10 c. c. and *B. coli* absent. Probably this is due to trains receiving water at towns using hypochlorite in their supplies. Dr. Creel made a rather intensive study of these organisms.

Although the presumptive test may be allowable where the pollution is considerable and the number of *B. coli* is large, there are many places where it would give very erroneous results. In the examination of oysters and the water over the beds, where the pollution is remote and where the standards of purity are very rigid, the conditions are just such as to obtain a large number of positive presumptive tests, although colon bacilli are comparatively few. Savage quotes a case where, of 65 samples of shellfish, 15 showed *B. enteritidis sporogenes*, while *B. coli* was present in only two samples. Similar results were obtained in the present investigation, where in 665 sets of tubes, made from oysters from polluted and clean sources, the average number of *B. coli* was less than 60 per cent of the total number of gas formers.

Conclusions: 1. The reliability of the lactose-broth and lactose-bile presumptive test varies directly with the degree of pollution, therefore inversely with the remoteness in time and distance from the source of pollution. This is due to the general occurrence of a group of organisms in small and almost constant numbers (approximating 1 per c. c.), which are not manifest when the number of *B. coli* is large, but appear evident when the number of *B. coli* approaches or is less than 1 per c. c.

2. These organisms are of the group of spore-forming, lactose-fermenting anaerobes, and are thus eliminated by the aerobic endoplate.

Observations on the relative merits of lactose bile and lactose broth.—Many workers have advocated the use of lactose bile as a medium for the isolation of sewage-gas formers, and the 1912 committee on standard methods of water analysis of the American Public

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Health Association recommended its use. It is claimed that it is unnecessary in an extensive study to confirm the results of the lactose bile fermentation test, as only the sewage forms, *B. coli* or *B. welchii*, ferment the medium. It has been stated, furthermore, that the number of tubes showing gas closely compares with the number of *B. coli*, as determined by enrichment in lactose broth, and subsequently confirmed by the laborious methods of subculture tests. Thus a great deal of labor would be saved by using lactose bile as a presumptive test instead of following the old procedure, although by using endoplates alone for confirmation the saving in work is not considerable.

It was thought advisable in this investigation to run a duplicate set of tests, using both media side by side, thus making an exact comparison of the reliability of the lactose-bile tubes and the plain lactose-broth tubes, both with and without the endoplate and further confirmation.

In all 1,851 parallel sets of broth and bile tubes were recorded, 1,148 of which were made from the river water from various points, 38 from fresh sewage, and 665 from oysters. The results of these tests are summarized in Table 11, where are given the number of samples, the percentage positive in the various dilutions, the number of organisms per c. c. calculated by Phelps's method with broth and bile, both presumptive and confirmed, and the percentage confirmed in each.

TABLE 19.—*Results obtained from 1,851 samples planted in both lactose broth and lactose bile.*

	Percentage of samples containing B. coli in—									
	10 c. c.		1 c. c.		0.1 c. c.		0.01 c. c.		0.001 c. c.	
	Broth.	Bile.	Broth.	Bile.	Broth.	Bile.	Broth.	Bile.	Broth.	Bile.
Above Giesboro Point	.....	.....	.....	.....	86.8	77.4	49.0	34.0	7.5	7.5
Giesboro Point	.....	.....	.....	.....	100.0	86.4	76.2	49.1	20.3	8.5
Fort Foote	.....	.....	.....	.....	98.5	96.8	82.0	75.0	22.0	6.6
Fort Washington	.....	.....	.....	.....	96.6	98.4	80.0	63.3	26.7	6.7
Whitestone Point	.....	.....	.....	.....	94.3	98.6	72.8	64.2	15.7	7.1
Indianhead	.....	.....	94.2	94.4	92.2	90.0	65.8	48.9	11.1	10.0
Possum Point	89.7	89.7	88.8	88.8	71.0	71.0	33.6	13.1	2.8	.9
Maryland Point	76.2	67.4	56.5	44.9	15.6	6.8	2.0	.7	.....	.....
Popes Creek	60.4	45.6	27.1	12.0	4.4	1.2	.....	.....	.....	.....
Lower Cedar Point	60.6	42.9	22.5	9.9	.....	.....	.....	.....	.....	.....
Below Lower Cedar Point	33.7	21.9	11.1	4.8	.7	.4	.....	.....	.....	.....
Total above Maryland Point	94.4	92.0	93.2	92.0	89.0	87.2	63.0	46.2	14.0	8.4
Total below Possum Point	52.9	40.3	26.5	16.3	5.0	2.0	.5	.2	.....	.....
Grand total	92.9	82.6	73.3	64.8	54.8	51.6	36.5	26.6	8.0	3.7
	0.0001 c. c.		0.00001 c. c.		0.000001 c. c.					
Sewage	94.7	76.3	44.7	18.4	5.3	0.0	.....	.....	.....	.....
			1 c. c.		0.1 c. c.					
Oysters	.....	.....	20.9	18.3	7.2	5.6	.....	.....	.....	.....

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TABLE 19.—*Results obtained from 1,851 samples planted in both lactose broth and lactose bile*—Continued.

	B. coli per c. c.				Percentage confirmed.		Number of samples.
	Broth presumptive.	Broth confirmed.	Bile presumptive.	Bile confirmed.	Broth.	Bile.	
Above Giesboro Point	128	120	114	106	94.0	92.7	53
Giesboro Point	202	202	134	129	100.0	96.2	59
Fort Foote	305	290	138	133	95.0	96.7	61
Fort Washington	336	325	129	127	96.7	98.3	60
Whitestone Point	229	216	133	131	94.3	98.6	70
Indianhead	178	168	146	143	94.5	97.7	90
Possum Point	69.6	63	28	27	90.5	96.0	107
Maryland Point	5.2	4	2.6	2	76.2	81.8	148
Popes Creek	1.10	.72	.23	.16	65.3	69.9	159
Lower Cedar Point	.38	.27	.20	.14	70.5	71.4	71
Below Lower Cedar Point	.42	.19	.17	.11	45.4	64.8	270
Total above Maryland Point	206	192	111	108	93.2	97.3	500
Total below Possum Point	2.0	1.2	.77	.56	61.5	72.8	648
Grand total	119	84	54	47	70.3	86.8	1,148
Sewage	.....	97,400	.....	24,200	100.0	96.7	38
Oysters	1.61	.93	1.20	.74	57.7	61.6	665

It may be observed that throughout the lactose broth gave higher results, confirmed as well as presumptive, than lactose bile. The percentage of positive lactose-bile tubes confirmed on endomedia is consistently greater than on lactose broth, but had they all been confirmed they would neither have given as high a result as the confirmed tubes on lactose broth, nor would they generally have given as near the true figure as the presumptive lactose-broth tubes. Chart E presents these results graphically and shows convincingly that for the Potomac River water, at least, lactose broth is a more reliable medium for the presumptive test than lactose bile, except at the lower-river stations, remote from pollution, where the bile presumptive test is more reliable.

The latter result is rather surprising, since it has been claimed that the bile presumptive test gives close to the actual number of *B. coli* where the pollution is fresh, but fails to give all the forms where the pollution is remote, because some are weakened and can not ferment bile, according to the last report of the American Public Health Association on "Standard Methods of Water Analysis" (1912, p. 88):

> In tests on sewage and contaminated waters, however, the lactose bile has been proven to give positive results in higher dilutions than any other medium.

The above statement is not in accord with the results obtained in this investigation of conditions existing in the Potomac River water or Washington sewage, for the lactose broth consistently gave positive results in higher dilutions than lactose bile; and when the presumptive bile test alone was used, as recommended, the results corre-

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sponded more closely with the actual number of *B. coli* present in the relatively clean lower-river water than it did where the river was freshly polluted. The lactose broth presumptive test would have given nearer the actual number of *B. coli* where the river was freshly polluted, while the bile presumptive test would have given closer results where it was distant from pollution.

The report on standard methods furthermore states (p. 87): "Attenuated *B. coli* does not represent recent contamination, and all *B. coli* not attenuated grows readily in lactose bile." The results on sewage seem to contradict this, since lactose bile only yielded 25 per cent of the number of *B. coli* calculated from lactose broth, while in the river the bile gave from 50 to 70 per cent as many *B. coli* as the broth. Jordan, of Chicago, has published similar results (Fifteenth International Congress of Hygiene, Transactions, vol. 2, parts 1, 2, pp. 48), proving conclusively that freshly isolated strains of *B. coli* were inhibited to as great or greater degree than older strains. It would seem, therefore, that the advantage of lactose bile over lactose broth is more apparent than real.

The disadvantages of lactose broth as a presumptive test, as an index of river pollution, are thus shared by the lactose bile. The curves of each on Chart E are strikingly similar, except that the bile curve falls short of the lactose-broth curve at all points. The curves showing the percentage of fermentation tubes confirmed on endo reveal the failure of the presumptive test. Where the river is highly polluted, both give results comparing closely with the confirmed endoplates. Where the river begins to purify itself and the number of *B. coli* diminish, there the reliability of the presumptive test also fails. As has been aptly said, "the presumptive test is reliable when *B. coli* is present."

Considering, therefore, the failure of the presumptive test alone, it is evident that some check must be imposed upon it. Longley and Baton, working at the Washington, D. C., filtration plant with Potomac River water and with dextrose, both state: "The best presumptive test we could use for the conditions in this laboratory would be the preliminary fermentation tube followed by the litmus lactose agar-agar plate." (Journal of Infectious Dis., vol. 4, p. 411.)

What is here said of the litmus lactose agar is even truer of the endo plate, for heavier transfers may be made and the appearance of *B. typhosus* and *B. coli* on endo is very characteristic. By this one additional step the efficiency of the "presumptive test" may be made nearly 100 per cent.

W. H. Frost, working in the hygienic laboratory in 1909, found the efficiency of endo medium to be about 96 per cent. (Hygienic Laboratory Bull. 78, pp. 73 to 134.)

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Since it is necessary to go one step beyond the fermentation tube, there is every advantage to be gained by using an enrichment medium which will give the largest number of *B. coli* to start with. The lactose broth is preferable for this purpose and diminishes the time necessary for the test. For these reasons the technique described elsewhere was adopted in the isolation of *B. coli*.

From a consideration of the evidence presented concerning the influence of the anaerobes described, the comparative merits of broth and bile media and the status of the presumptive test, it is believed that the following conclusions may be derived:

1. The reliability of the lactose-broth and lactose-bile presumptive test varies directly with the degree of the pollution, and inversely with the remoteness in time and distance from the source of the pollution.

2. This is due to the general occurrence of a group of spore-forming, lactose-fermenting, anaerobic organisms, in small but almost constant numbers (approximating 1 per c. c.), which are not sufficient to become manifest when the number of *B. coli* is large, but become evident when the latter is reduced to about 1 per c. c. or less. These anaerobes are eliminated by the aerobic endo plate.

3. The anaerobes may be separated from nonspore-bearing organisms, such as *B. coli*, by heating the water to 70° for 10 minutes and inoculating into freshly sterilized lactose-broth tubes.

4. The anaerobes resist ordinary hypochlorite disinfection of water, and may be recovered from waters so treated.

5. They persist for long periods of time and are therefore found in remotely polluted surface waters and oyster beds. Hence, the results obtained by the use of the presumptive tests alone under such conditions are erroneous, especially in the examination of oyster beds remote from pollution.

6. They seem to be almost universally distributed in decomposing organic matter, and this, together with their much greater resistance, gives their presence a significance different from that of *B. coli*.

Observations on endo medium as a means of confirming B. coli.—In this investigation the classification of organisms of sewage origin, suggested by Jackson and adopted by the American Public Health Association in 1912, has been followed. Endo agar plates, in conjunction with the enrichment fermentation tubes, have been used throughout and the results computed on this basis. In confirming presence of the *B. coli* group, the endo medium, originally introduced as a means of isolating *B. typhosus*, was found admirably efficient. The striking appearance of the *B. coli* group renders them unmistakable; moreover, because of the selective action of the medium, large transfers are possible and particularly advantageous where the

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number of *B. coli* present in the enrichment tube is relatively small. Depending, as does this method, upon a surface growth, the transparency of the medium is not important, hence tedious and difficult clarification methods are unnecessary.

Lactose broth, lactose peptone bile, and litmus lactose agar were prepared according to the standard methods adopted by the American Public Health Association. For the endo agar certain modifications, adopted by the hygienic laboratory, simplify the preparation as follows: To 1,000 c. c. of water are added sodium chloride 5 gm., Leibig's beef extract 10 gm., Witte's peptone 10 gm.; solution is effected by heat, and, after cooling, 30 gm. powdered agar are sprinkled on the surface of the solution and allowed to dissolve without stirring. Sufficient 10 per cent solution of anhydrous sodium carbonate is added to make the medium slightly alkaline to litmus. A very clear medium may be obtained by allowing the agar to settle and harden in some vessel from which it may be turned out en masse. The bottom layer, containing practically all of the sediment, may be cut off with a knife, the agar then remelted and stored in 200 c. c. lots in long-necked Erlenmeyer or Florence flasks of 250 c. c. capacity. The medium is allowed to remain in an Arnold sterilizer at 100° for three hours.

A further simplification of the process may be effected by the preparation of a stock solution of such strength that 10 c. c. shall contain lactose 2 gm., sulphite 5 gm., in distilled water, with 1 c. c. of a 10 per cent solution of basic fuchsin in 96 per cent alcohol. By keeping the lactose crystals suspended near the top of the water, convection currents cause it to melt very rapidly, and it is not necessary to reduce the crystals to powder. When plates are needed, 10 c. c. of this stock solution are added to each 200 c. c. of liquefied agar, the flask agitated gently to diffuse the solution without foaming, and the plates poured. The Petri dishes are allowed to stand with the tops off in a dark, dust-free room for 20 to 30 minutes. Plates not immediately needed may be stored for several days in a refrigerator room.

The stability of this stock solution having been questioned, a quantity made July 8 and set aside was later compared with solutions made July 20, August 7, and August 24, with the following results:

TABLE 20.—*Number of positive results obtained.*

Solutions made	July 8.	July 20.	Aug. 7.	Aug. 24.
Fresh-stock solution	22	13	18	12
Old-stock solutions	22	13	15	10
Percentage of efficiency that old solution bears to new solutions	100%	100%	83%	83%

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As the table shows, the old solution retained 100 per cent of its efficiency for at least two weeks and lost 17 per cent of its efficiency after 30 days. The results therefore justify the conclusion that the solution may safely be used for at least two weeks.

For confirmation of characteristic colonies typical colonies of the *B. coli* group were fished from endo plates made during the routine examinations of river water and transferred to agar slants. From the same tubes from which the endo plates had been smeared litmus lactose agar plates were made according to the following procedure: A platinum needle was dipped into the tube and washed off in a tube containing 5 c. c. of sterile water. Two loops of this suspension were transferred to a tube of litmus lactose agar, and from this tube another loopful was put into a second litmus lactose agar tube. Both of the tubes were poured into Petri dishes and incubated for 24 hours at 37°, after which they were examined for typical growths which were transferred to agar slants. The cultures so obtained were incubated, and, if found to be pure, transferred to the following media: Peptone solution, nitrate solution, litmus milk, mannite, saccharose, raffinose, and dulcite broths.

Determination of motility was also made as soon after isolation as was practicable. Gelatin stabs were inoculated with small portions of the pure cultures and incubated at 20° for 14 days, being examined daily for evidence of liquefaction.

The various subculture procedures were those recommended by the Report on Standard Methods of the American Public Health Association.

During the routine examination of the samples taken throughout the investigation 210 pure cultures were studied, representing all phases of the work. These cultures were isolated from tubes which had shown lactose fermentation and had given a positive metallic sheen on endo agar plates, or had shown the characteristic red colonies on lactose litmus agar.

Table 21 presents a complete and detailed tabulation of all the results obtained by the methods described. The abbreviations used under "Action on milk," indicate the following: a=acid reaction; c=coagulation; r=reduction of litmus; g=such gas formation in the tube as to have been evident. As it is shown by the column "Fermentation medium" all of the samples were taken from tubes which had shown fermentation of lactose in either broth or bile. Motility is expressed by +, the degree of motility not having been noted. The + sign under mannite, saccharose, dulcite, and raffinose indicates the formation of gas.

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TABLE 21.—*Results of confirmatory tests upon 210 lactose-splitting gas-forming organisms.*

No.	Date.	Sample obtained from—	Depth.	Fermentation medium.	Per cent gas.	Medium used for isolation.	Motility.	Action on milk.	Indol.	Reduction of nitrates.	Action on gelatin.	Mannite.	Saccharose.	Dulcite.	Raffinose.
	1913.		*Feet.*												
1	Dec. 4	Maryland Point, middle channel.	2	Lactose broth.	30	Endo agar	+	a-c-r	+	+	−	+	−	+	−
2	...do	...do	2	Lactose bile	25	...do	+	a-c-r	+	+	−	+	+	+	+
3	...do	Possum Point, Virginia side.	2	...do	95	...do	+	a-c	Trace.	+	−	+	+	−	−
4	...do	Possum Point, Virginia side channel.	20	...do	75	Endo	+	a-c	+	+	−	+	+	−	−
5	...do	Possum Point, Maryland side channel.	20	Lactose broth.	25	...do	+	a-c-r	+	+	−	+	+	+	+
6	...do	Indian Head, Maryland side.	2	...do	95	...do	+	a-c-r	+	+	−	+	−	+	−
7	...do	Indian Head, Maryland side channel.	20	Lactose bile	30	...do	+	a-c-r	+	+	−	+	+	−	−
8	...do	Indian Head, Virginia side channel.	20	Lactose broth.	50	...do	+	a-c-r	+	+	−	+	+	+	+
9	...do	Whitestone Point channel	20	...do	95	...do	+	a-c-r	+	+	−	+	+	−	−
10	...do	Fort Washington channel	20	...do	20	...do	+	a-c-r	+	+	−	+	+	+	+
11	...do	Fort Foote channel	2	...do	35	...do	−	a-c-r	−	+	−	+	+	+	+
12	...do	...do	20	...do	50	...do	−	a-c-r	+	+	−	+	+	−	+
13	...do	Seventeenth and D Streets	2	...do	20	...do	+	a-c-r	+	+	−	+	+	+	+
14	Dec. 5	Marshall Hall channel	18	...do	25	Litmus lactose agar	+	a-c-r	+	+	−	+	+	+	+
15	...do	Fort Foote channel	25	...do	20	...do	+	a-c-r	+	+	−	+	+	+	+
16	...do	Giesboro Point, Maryland side.	2	...do	2	...do	+	a-c	−	+	−	+	+	−	+
17	...do	Giesboro Point channel	25	...do	20	...do	+	a-c	+	+	−	+	−	+	−
18	...do	Giesboro Point, Virginia side.	2	...do	20	...do	−	a-c-r	+	+	−	+	+	−	+
19	...do	Railroad bridge	2	...do	25	...do	+	a-c-r	+	+	−	+	+	−	+
20	...do	Sewage Pumping station		...do	20	...do	−	a-c-r-g	+	+	−	+	+	−	+
21	Dec. 8	Possum Point channel	18	...do	20	...do	+	a-c-r	Trace.	+	−	+	+	−	−
22	...do	Indianhead, Maryland side	2	...do	20	...do	+	a-c-r	+	+	−	+	+	+	+
23	...do	Indianhead channel	20	...do	25	...do	+	a-c-r	+	+	−	+	+	+	+
24	...do	Whitestone Point channel	2	...do	15	...do	+	a-c	Trace.	+	−	−	+	+	+
25	...do	...do	2	...do	15	Endo	+	a-c-r	+	+	−	+	+	+	+
26	...do	Fort Washington channel	2	...do	15	...do	+	a-c-r	+	+	−	+	+	+	+
27	...do	...do	20	...do	30	...do	+	a-c-r	Trace.	+	−	+	+	+	+
28	...do	Fort Foote channel	2	...do	20	...do	+	a-c-r	+	+	−	+	+	+	+
29	...do	Fort Foote, Virginia side	2	...do	25	...do	−	a-c-r	+	+	−	+	+	−	+
30	...do	Giesboro Point, Maryland side.	2	...do	55	...do	+	a-c-r	+	+	−	+	+	+	+
31	...do	Giesboro Point channel	2	...do	50	...do	+	a-c	+	+	−	+	+	+	+
32	...do	Indianhead channel	20	...do	25	...do	+	a-c	+	+	−	+	−	+	−

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TABLE 21.—*Results of confirmatory tests upon 210 lactose-splitting gas-forming organisms*—Continued.

No.	Date.	Sample obtained from—	Depth.	Fermentation medium.	Per cent gas.	Medium used for isolation.	Motility.	Action on milk.	Indol.	Reduction of nitrates.	Action on gelatin.	Mannite.	Saccharose.	Dulcite.	Raffinose.
	1913.		*Feet.*												
71	Dec. 15	Seventeenth and D Streets channel.	2	Lactose broth.	10	Endo	+	a-c-r-g.	+	+	−	+	+	+	+
72	...do	...do	2	Lactose bile	60	...do	+	a-c-r	+	+	−	+	+	−	−
73	...do	Railroad bridge	2	...do	70	...do	+	a-c	+	+	−	+	−	+	−
74	...do	Giesboro Point, Virginia side.	2	Lactose broth.	35	...do	+	a-c-g	+	+	−	+	+	+	+
75	...do	Giesboro Point channel	2	...do	20	...do	+	a-c-r	−	+	−	+	+	−	+
76	...do	...do	2	Lactose bile	60	...do	+	a-c-g	+	+	−	+	−	−	−
77	...do	Giesboro Point, Maryland side.	2	Lactose broth.	25	...do	−	a-c-g	+	+	−	+	+	−	+
78	...do	Fort Foote, Virginia side	2	...do	50	...do	+	a-c	+	+	−	+	−	−	−
79	...do	...do	2	Lactose bile	55	...do	+	a-c-g	+	+	−	+	+	−	−
80	...do	Fort Foote channel	2	Lactose broth.	30	...do	+	a-c-g	+	+	−	+	−	−	−
81	...do	...do	2	Lactose bile	100	...do	+	a-c-g	+	+	−	+	+	+	+
82	...do	Fort Foote, Maryland side	2	Lactose broth.	10	...do	+	a-c-r	+	+	−	+	+	+	+
83	...do	...do	2	Lactose bile	60	...do	+	a-c-g	+	+	−	+	+	+	+
84	...do	Fort Washington, Virginia side.	2	...do	60	...do	+	a-c-r	Trace.	+	−	+	+	−	−
85	...do	Fort Washington channel	2	Lactose broth.	40	...do	+	a-c-g	+	+	−	+	+	−	−
86	...do	...do	2	Lactose bile	100	...do	+	a-c-g	+	+	−	+	+	−	−
87	...do	Fort Washington, Maryland side.	2	Lactose broth.	5	...do	+	a-c-r	+	+	−	−	−	−	−
88	...do	...do	2	Lactose bile	65	...do	+	a-c-g	+	+	−	+	−	−	+
89	...do	Whitestone Point, Virginia side.	2	Lactose broth.	50	...do	+	a-c	+	+	−	+	+	+	+
90	...do	...do	2	Lactose bile	60	...do	+	a-c-g	+	+	−	+	+	−	−
91	...do	Whitestone Point channel	2	...do	70	...do	+	a-c-g	+	+	−	+	+	+	+
92	...do	Whitestone Point, Maryland side.	2	Lactose broth.	95	...do	+	a-c-g	+	+	−	+	+	−	−
93	...do	Indianhead, Virginia side	2	Lactose bile	45	...do	+	a-c-g	+	+	−	+	−	−	−
94	...do	Indianhead, Virginia side channel.	2	...do	65	...do	−	a-c-g	+	+	−	+	+	−	+
95	...do	Indianhead, Maryland side channel.	2	Lactose broth.	60	...do	+	a-c-r-g	+	+	−	+	−	+	−
96	...do	...do	2	Lactose bile	70	...do	+	a-c-g	+	+	−	+	+	+	+
97	...do	Indianhead, Maryland side	2	Lactose broth.	40	...do	+	a-c-g	+	+	−	+	−	+	+
98	...do	...do	2	Lactose bile	80	...do	+	a-c	+	+	−	+	−	+	+
99	...do	Possum Point, Virginia side.	2	Lactose broth.	45	...do	+	a-c-g	+	+	−	+	+	+	+
100	...do	...do	2	Lactose bile	20	...do	+	a-c-r	+	+	[1] +	−	+	−	−
101	...do	Possum Point, Virginia side channel.	2	...do	85	...do	+	a-c	+	+	−	+	−	+	−

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102	...do.....	Possum Point, Maryland side.	2	.....do.....	85	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
103	...do.....	Sewage Pumping Station....	.....	Lactose broth.	20	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
104	...do.....	Milk.....	.....	Lactose bile.....	.....	.....do.....	+	a-c.....	+	+	−	+	−	−	−
105	...do.....	Sewage Pumping Station....	.....	.....do.....	30	.....do.....	+	a-c.....	+	+	−	+	−	+	−
106	...do.....	Possum Point, Virginia side channel.	2	Lactose broth.	5	.....do.....	+	a-c-g....	+	+	[2]+	+	+	−	−
107	...do.....	Giesboro Point, Virginia side.	2	Lactose bile...	60	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
108	...do.....	Seventeenth and D Streets..	2	.....do.....	60	Litmus lactose agar...	+	a-c-g....	+	+	−	+	+	−	−
109	...do.....	Railroad bridge.....	2	.....do.....	70	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
110	...do.....	Giesboro Point channel.....	2	Lactose broth.	20	.....do.....	+	a-c-g....	−	+	−	+	+	−	+
111	...do.....	Giesboro Point, Virginia side.	2	Lactose bile...	60	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
112	...do.....	Giesboro Point channel.....	2	.....do.....	60	.....do.....	+	a-c.....	+	+	−	+	+	−	−
113	...do.....	Fort Foote, Virginia side....	2	Lactose broth.	50	.....do.....	+	a-c.....	+	+	−	+	+	−	−
114	...do.....	.....do.....	2	Lactose bile...	55	.....do.....	+	a-c.....	+	+	−	+	+	−	−
115	...do.....	Fort Foote channel.....	2	.....do.....	100	.....do.....	+	a-c-g....	−	+	−	+	+	+	+
116	...do.....	Fort Foote, Maryland side...	2	Lactose broth.	10	.....do.....	+	a-c-g....	−	+	−	+	+	+	+
117	...do.....	.....do.....	2	Lactose bile...	60	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
118	...do.....	Fort Washington, Virginia side.	2	Lactose broth.	55	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
119	...do.....	.....do.....	2	Lactose bile...	60	.....do.....	+	a-c.....	+	+	−	+	+	−	−
120	...do.....	Fort Washington channel....	2	.....do.....	100	.....do.....	+	a-c.....	+	+	−	+	+	−	−
121	...do.....	Fort Washington, Maryland side.	2	.....do.....	65	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
122	...do.....	Whitestone Point, Virginia side.	2	.....do.....	60	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
123	...do.....	Whitestone Point channel...	2	.....do.....	70	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
124	...do.....	Whitestone Point, Maryland side.	2	.....do.....	95	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
125	...do.....	Indianhead, Virginia side....	2	.....do.....	45	.....do.....	+	a-c.....	+	+	−	+	+	+	+
126	...do.....	Indianhead, Virginia side channel.	2	.....do.....	65	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
127	...do.....	Indianhead, Maryland side channel.	2	Lactose broth.	60	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
128	...do.....	.....do.....	2	Lactose bile...	70	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
129	...do.....	Indianhead, Maryland side..	2	Lactose broth.	40	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
130	...do.....	.....do.....	2	Lactose bile...	80	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
131	...do.....	Possum Point, Virginia side.	2	Lactose broth.	45	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
132	...do.....	Possum Point, Virginia side channel.	2	Lactose bile...	85	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
133	Dec. 18	.....do.....	2	Lactose broth.	70	Endo.....	+	a-c-g....	+	+	−	+	+	−	−
134	...do.....	.....do.....	2	Lactose bile...	70	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
135	...do.....	.....do.....	15	Lactose broth.	30	.....do.....	−	a-c.....	+	+	−	+	+	−	+
136	...do.....	Possum Point, Maryland side, channel.	2	Lactore bile...	80	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
137	...do.....	.....do.....	2	Lactose broth.	40	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
138	...do.....	.....do.....	15	.....do.....	10	.....do.....	−	a-c.....	+	+	−	+	+	−	+
139	...do.....	Possum Point, Maryland side.	2	.....do.....	30	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
140	...do.....	Indianhead, Virginia side....	2	.....do.....	60	.....do.....	+	a-c.....	+	+	−	+	+	−	−
141	...do.....	Maryland Point, Virginia side.	2	.....do.....	70	.....do.....	−	a-c-g-r..	+	+	−	+	+	−	+

[1] 4 days.

[2] 2 days.

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TABLE 21.—*Results of confirmatory tests upon 210 lactose-splitting gas-forming organisms*—Continued.

No.	Date.	Sample obtained from—	Depth.	Fermentation medium.	Per cent gas.	Medium used for isolation.	Motility.	Action on milk.	Indol.	Reduction of nitrates.	Action on gelatin.	Mannite.	Saccharose.	Dulcite.	Raffinose.
	1913.		*Feet.*												
142	Dec. 18	Possum Point, Virginia side.	2	Lactose bile...	70	Endo	+	a-c-g	+	+	−	+	+	+	+
143	...do	...do	2	Lactose broth.	45	...do	+	a-c-g	+	+	−	+	+	+	+
144	Dec. 19	Sewage Pumping Station		...do	20	...do	+	a-c-g	+	+	−	+	+	+	+
145	...do	...do		Lactose bile...	25	...do	+	a-c	+	+	−	+	+	+	+
146	Dec. 18	Indianhead channel	15	...do	60	...do	+	a-c-g	+	+	−	+	+	+	+
147	...do	Indianhead, Maryland side.	2	...do	60	...do	−	a-c-g	+	+	−	+	+	−	+
148	...do	Whitestone Point, Virginia side.	2	Lactose broth.	30	...do	+	a-c-g	+	+	−	+	+	+	+
149	...do	Whitestone Point channel	2	...do	30	...do	−	a-c-g	+	+	−	+	+	−	+
150	...do	...do	15	...do	50	...do	+	a-c	+	+	−	−	+	+	+
151	...do	...do	15	Lactose bile...	60	...do	+	a-c-g	+	+	−	+	+	−	−
152	...do	Fort Washington, Maryland side.	2	...do	5	...do	+	a-c-g	+	+	−	+	+	+	+
153	...do	Fort Foote, Virginia side	2	Lactose broth.	40	...do	+	a-c-g	+	+	−	+	−	+	−
154	...do	...do	2	Lactose bile...	70	...do	+	a-c-g	+	+	−	+	−	+	−
	1914.														
155	Jan. 3	Seventeenth and D Streets	2	Lactose broth.	15	...do	+	a-c-g	+	+	−	+	+	−	−
156	...do	Railroad bridge	2	...do	50	...do	−	a-c-g	+	+	−	+	+	−	+
157	...do	...do	2	Lactose bile...	60	...do	+	a-c-g	+	+	−	+	+	−	−
158	...do	Giesboro Point, Virginia side.	2	...do	95	...do	+	a-c-g	+	+	−	+	+	+	+
159	...do	Giesboro Point channel	2	Lactose broth.	50	...do	+	a-c	+	+	−	+	+	+	+
160	...do	...do	2	Lactose bile...	90	...do	+	a-c-g	+	+	−	+	+	+	+
161	...do	Giesboro Point, Maryland side.	2	Lactose broth.	85	...do	−	a-c-g	+	+	−	+	+	−	+
162	...do	...do	2	Lactose bile...	75	...do	+	a-c	+	+	−	+	+	−	−
163	...do	Fort Foote, Virginia side	2	Lactose broth.	25	...do	−	a-c-g	+	+	−	+	+	−	+
164	...do	...do	2	Lactose bile...	95	...do	−	a-c-g	+	+	−	+	+	−	+
165	...do	Fort Foote channel	2	Lactose broth.	40	...do	+	a-c-r	+	+	−	+	−	+	−
166	...do	...do	2	Lactose bile...	75	...do	+	a-c-g	+	+	−	+	+	+	+
167	...do	Fort Foote, Maryland side	2	Lactose broth.	35	...do	+	a-c-r	+	+	−	+	+	−	+
168	...do	...do	2	Lactose bile...	55	...do	+	a-c	+	+	−	+	+	−	−
169	...do	Fort Washington, Virginia side.	2	Lactose broth.	25	...do	−	a-c	+	+	−	+	+	−	+
170	...do	...do	2	Lactose bile...	65	...do	−	a-c-g	+	+	−	+	+	−	+
171	...do	Fort Washington channel	2	Lactose broth.	30	...do	+	a-c-g	+	+	−	+	+	+	+
172	...do	...do	2	Lactose bile...	50	...do	+	a-c-g	+	+	−	+	+	+	+
173	...do	Fort Washington, Maryland side.	2	...do	90	...do	+	a-c-g	+	+	−	+	+	+	+

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174	...do.....	Whitestone Point, Virginia side.	2	.....do.....	60	.....do.....	+	a-g-g....	+	+	−	+	+	−	−
175	...do.....	Whitestone Point channel...	2	Lactose broth.	45	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
176	...do.....	.....do.....	2	Lactose bile...	95	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
177	...do.....	Whitestone Point, Maryland side.	2	Lactose broth.	25	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
178	...do.....	.....do.....	2	Lactose bile...	55	.....do.....	+	a-c.....	+	+	−	+	+	−	−
179	Jan. 7	Popes Creek, Virginia side...	2	.....do.....	80	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
180	...do.....	Popes Creek, Maryland side..	2	Lactose broth.	60	.....do.....	−	a-c-g....	+	+	−	+	+	+	+
181	...do.....	Maryland Point, Virginia side channel.	2	.....do.....	30	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
182	...do.....	Maryland Point, Maryland side channel.	2	Lactose bile...	95	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
183	...do.....	Possum Point, Virginia side..	2	.....do.....	80	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
184	...do.....	Possum Point, Virginia side channel.	15	Lactose broth.	60	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
185	...do.....	Possum Point, Maryland side channel.	2	Lactose bile...	50	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
186	...do.....	Possum Point, Maryland side.	2	.....do.....	50	.....do.....	+	a-c-g....	−	+	−	+	+	−	−
187	...do.....	Indianhead, Virginia side....	2	.....do.....	15	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
188	...do.....	Indianhead, Virginia side channel.	2	.....do.....	75	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
189	...do.....	Indianhead, Maryland side..	2	Lactose broth.	65	.....do.....	+	a-c.....	+	+	−	+	+	+	+
190	...do.....	Whitestone Point, Virginia side channel.	2	Lactose bile...	60	.....do.....	−	a-c-g....	+	+	−	+	+	−	+
191	...do.....	Whitestone Point, Maryland side channel.	2	Lactose broth.	25	.....do.....	+	a-c.....	−	+	−	+	+	+	+
192	Jan. 10	Indianhead, Virginia side....	2	.....do.....	40	.....do.....	+	a-c.....	+	+	−	+	−	+	−
193	...do.....	.....do.....	2	Lactose bile...	75	.....do.....	+	a-c-g....	+	+	−	+	−	+	+
194	...do.....	Indianhead, Virginia side channel.	2	Lactose broth.	40	.....do.....	+	a-c-g....	+	+	−	+	−	+	−
195	...do.....	.....do.....	2	Lactose bile...	60	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
196	...do.....	.....do.....	15	.....do.....	5	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
197	...do.....	Indianhead, Maryland side channel.	2	Lactose broth.	30	.....do.....	+	a-c-g....	+	+	−	+	+	−	−
198	...do.....	.....do.....	15	.....do.....	40	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
199	...do.....	.....do.....	15	Lactose bile...	55	.....do.....	+	a-c.....	−	+	−	+	+	−	+
200	...do.....	Indianhead, Maryland side..	2	.....do.....	30	.....do.....	+	a-c.....	+	+	−	+	+	−	−
201	...do.....	Whitestone Point, Virginia side.	2	.....do.....	85	.....do.....	+	a-c.....	+	+	−	+	+	.....	.....
202	...do.....	Whitestone Point channel...	2	Lactose broth.	50	.....do.....	+	a-c.....	+	+	−	+	+	−	−
203	...do.....	.....do.....	2	Lactose bile...	65	.....do.....	+	a-c.....	+	+	−	+	+	−	−
204	...do.....	.....do.....	15	.....do.....	75	.....do.....	+	a-c-g....	+	+	−	+	+	+	+
205	...do.....	Fort Washington channel...	2	.....do.....	65	.....do.....	+	a-c.....	+	+	−	+	+	−	−
206	...do.....	Fort Foote channel.....	2	.....do.....	75	.....do.....	−	a-c-g....	+	+	−	+	+	+	+
207	...do.....	.....do.....	15	.....do.....	65	.....do.....	−	a-c-g....	+	+	−	+	+	+	+
208	...do.....	Seventeenth and D Streets..	2	.....do.....	70	.....do.....	+	a-c.....	−	+	−	+	+	+	+
209	...do.....	Railroad bridge.....	2	.....do.....	5	.....do.....	−	a-c.....	+	+	−	+	+	−	−
210	...do.....	Giesboro Point channel.....	2	.....do.....	5	.....do.....	+	a-c.....	−	+	−	+	+	+	+

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Of 111 cultures enriched in lactose broth, 93 were transferred to endo agar and 18 to litmus lactose agar; while of 99 cultures enriched in lactose bile, 81 were transferred to endo agar and 18 to litmus lactose agar. The following tabulation shows that little difference can be noticed as to what particular members of the *B. coli* group are favored by either enrichment or a selective medium.

	B. communior.	B. communis.	B. aerogenes.	B. acidi lactici.	Miscellaneous.
Lactose broth	9	1	8	.....	.....
to					
Litmus lactose agar.....per cent..	50	5.5	44	.....	.....
Lactose broth	37	13	33	9	1
to					
Endo agar.....per cent..	40	14	35	10	1.1
Lactose bile	26	0	12	0	0
to					
Litmus lactose agar.....per cent..	33	.....	67	.....	.....
Lactose bile	29	5	37	8	2
to					
Endo agar.....per cent..	36	6.2	46	10	2.5

In the case of three organisms which could not be classed with the *B. coli* group, one was enriched in lactose broth, the other two in lactose bile, and all were then transferred to and isolated from endo agar.

Based upon the classification in the "standard methods," the 210 organisms are distributed as follows:

B. communior.	B. communis.	B. aerogenes.	B. acidi lactici.	Miscellaneous.
81	19	90	17	3
30.....Per cent..	9	43	8	1.4

Distributed according to varieties they fall into the following groups:

	A	A_1	A_2	A_3	B	B_1	B_2	C	D	Total.
B. communior	.....	72	7	.....	.....	.....	.....	2	.....	81
B. communis	1	.....	.....	.....	18	.....	.....	.....	.....	19
B. aerogenes	.....	33	6	.....	.....	.....	51	.....	.....	90
B. acidi lactici	.....	.....	4	.....	12	.....	.....	.....	1	17

It is interesting to note in this connection that Howe's "metabolic gradient" (E. C. Howe, Science, N. S. XXXV, p. 225) is more or less confirmed by these results. Of the 126 organisms which fermented raffinose only 5, or 4 per cent, also ferment saccharose. Arranging the sugars in the sequence suggested by Howe, the following is the result: Dextrose,[1] 207+; lactose, 207; saccharose, 183; raffinose, 126.

[1] As lactose was used in the routine enrichment medium from which the original cultures were isolated, the number of dextrose + lactose organisms are not indicated by these results.

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If all the stations above, and including Whitestone Point cross-sections, be grouped together as instances of comparatively recent pollution and those below that point as representing older pollution, the distributions of organisms is as follows: First group—*B. communior*, 35.3 per cent; *B. communis*, 7.4 per cent; *B. aerogenes*, 48.4 per cent; *B. acidi lactici*, 9 per cent. Second group—*B. communior*, 45.3 per cent; *B. communis*, 12 per cent; *B. aerogenes*, 37.3 per cent; *B. acidi lactici*, 4.8 per cent. The two groups which ferment saccharose—i. e., *B. communior* and *B. aerogenes*—comprised together 83.7 per cent of the whole number in the upper area and 82.6 in the area below Whitestone Point. It would appear, however, that the organisms which ferment dulcite are more resistant, for they occur in larger proportion in the lower area. These results are more or less in accord with the observations of other observers working with somewhat similar waters in temperate regions (Houston, 1911, 7th Report on Research, Metropolitan Water Board, London).

In conclusion, it may be said that of the 210 organisms which produced gas from lactose and which gave a positive reaction on litmus-lactose agar or endo agar 98.58 per cent were members of the *B. coli* group, as defined by the Standard Methods of the American Public Health Association. About the same proportion of organisms which gave positive *B. coli* characteristics on litmus-lactose agar and on endo agar were confirmed by the methods described.

For the examination of large numbers of samples, and where there are probably few organisms present, endo medium has a greater range of usefulness than litmus-lactose agar, because a greater quantity of the suspected culture can be transferred to the former. Where only a few samples are handled at irregular intervals, it is possible that litmus-lactose agar may be more convenient, but by using the modifications suggested, in the preparation and use of endo-agar plates, this medium is made easier to handle and more efficient than litmus-lactose agar in the average laboratory.

The use of an endo plate along with the lactose-broth tube is easy to apply, and so increases the reliability of the bacteriological test that this procedure is recommended as a standard method for conditions similar to those which exist in the Potomac River.

Observations comparing agar and gelatin counts.—Much discussion has taken place as to the relative merits of the agar and gelatin counts in the bacteriologocial examination of water. It is generally admitted that the counts are not the same, nor is there a constant ratio between the counts on agar at 27° and on gelatin at 20°. The question to be settled, therefore, is which gives the more useful information concerning the condition under study? From a bacteriological point of view it seems natural to expect that the organisms growing

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at body temperature would give a better indication of the sewage contamination. The ratio between the agar count and the number of *B. coli*, given in Table 14, proves that this is to a limited extent true. On the other hand, there is no doubt that the conditions of the Potomac, as regards rainfall and surface wash and the consequent variation in turbidity, are closely indicated by the gelatin count; for the curves of stream flow, turbidity readings and gelatin count are almost parallel. Theobald Smith in 1886 (Medical News, 1887, vol. 50, p. 404), discussing the bacterial content of the Potomac River, says: "It became possible to anticipate quite accurately the number of bacteria present by looking at the water in the tube by transmitted light." It is, moreover, during the time of high-stream flow with excessive surface wash, and when the time required for the transmission of germs from the source to the victim is short, that the danger of pollution is greatest. The gelatin counts, therefore, although they may not represent actual sewage contamination in the Potomac, do vary with factors which correspond to conditions of danger.

The seasonal variation of the ratios between the agar and gelatin counts for the year are given in Table 22. During the summer months the gelatin count is almost the same as the agar count. Gradually, as the temperature falls and the stream flow rises, the proportion of gelatin to agar count becomes larger. In February the ratio jumps until the gelatin count becomes sixteen times as great as the agar. It should be noticed that it is in the winter months, when the agar gives a much smaller proportional count than the gelatin, that the river water is in its most highly contaminated condition. The heavy rains wash the naked soil, with its accumulated surface filth, directly into the river until it becomes a stream of mud. The rapid current carries the infected matter in a surprisingly short time to its destination. Practically no sedimentation takes place in the stream, while, on the contrary, the accumulated sediments of months are scoured out and carried with the water. These are typical conditions of bad water, and though the agar count rises somewhat, it yet does lag behind. The gelatin, on the contrary, rises almost in a parallel curve with the turbidity. Perhaps the organisms washed into the river under these conditions are not sewage forms, but they do indicate a condition which should not be neglected. The sewage forms are best indicated by the test for *B. coli;* other conditions can be determined by turbidity readings or by the gelatin count, the latter being more sensitive.

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TABLE 22.—*Seasonal variations in the ratios of gelatin counts at 20° to agar counts at 37° at various cross sections.*

Cross sections.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.
Sewage at Washington	0.74	1.34	1.34	1.65	6.50	1.5	.....	2.4	7.62	3.71
Glasboro Point	1.24	1.06	1.46	2.65	.....	.....	.....	9.32	7.82	9.56
Fort Foote	1.31	1.15	1.67	3.42	.....	.....	.....	10.95	11.14	12.17
Fort Washington	2.45	.91	.72	2.36	.....	.....	.....	9.79	9.32	13.62
Mount Vernon	2.38	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marshall Hall	1.23	6.18	2.33	2.37	.....	.....	.....	2.00	.....	.....
Whitestone Point	.....	.....	.....	.....	.....	.....	.....	.....	10.43	.....
Maryland Point	1.41	1.00	2.00	2.75	6.67	4.73	10.88	5.00	9.17	.....
Popes Creek	.56	1.64	2.50	2.61	5.50	5.71	22.00	12.00	5.00	8.82
Lower Cedar Point	.....	1.16	3.85	3.47	2.65	6.05	17.71	15.23	7.27	8.82
Below Lower Cedar Point	.....	1.24	4.19	5.71	4.96	12.19	13.06	13.31	7.21	9.38
Average	1.41	1.84	2.23	3.00	5.25	6.06	15.91	10.89	8.33	9.34
Average monthly temperature (°C.)	21.6	18.6	13.5	8.5	4.5	2.6	3.5	6.6	14.8	.....
Average stream flow per second in thousands of cubic feet	3.8	2.8	10.6	15.3	12.7	26.5	20.4	25.1	25.8	12.9
Total rainfall at Washington for month, in inches	5.42	2.41	3.37	2.20	2.29	4.60	2.95	2.27	3.20	1.72

Gelatin is a very sensitive index of changes in a water. Large filtration plants everywhere have recognized its delicacy in giving information concerning processes of purification. The objection usually urged against its use has been the practical difficulty of incubating at 20° a medium which melts or softens at 21°. It requires an excellent incubator running at 20° to insure a maximum temperature of 21°. If the incubator exceeds 21° for a few minutes, the gelatin is softened sufficiently for motile liquifying organisms to work their way into the medium far enough to liquify it rapidly when incubated longer. One solution of this difficulty would be to lower the temperature of incubation to correspond more closely with that of European practice—i. e., from 15° to 18°—and to incubate longer if necessary. Any change in the method of using gelatin which would make it more practicable would be an improvement in the bacteriological examination of water.

[For a summary of the conditions of pollution of the Potomac River see the last section of this report, where pollution and purifications are considered together (p. 227).]

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SELF-PURIFICATION OF THE POTOMAC RIVER.

In the preceding section it was found convenient to describe briefly certain effects of purification observed in the upper river—the purification resulting from the action of manufacturing wastes in the Cumberland region, for example. The bacteriological evidence of the progressive purification of the water of the lower river was also presented and discussed to some extent. In the present section a more intimate study of the processes which tend to reduce and finally eliminate the pollution already introduced will be presented. Since these studies could be much more readily made in the lower river (i. e., from Great Falls to the mouth of the river), and the results there were at present of greater practical importance, they were confined largely to this area.

The factors concerned in the purification of streams as it occurs in nature are many, but are reducible on analysis to two main elements—the dying off of the bacteria of pollution and the oxidation of the organic constituents. All agencies of purification require time for their action, and in flowing streams it is important to appreciate the fact that it is the distance in time between successive points of observation and not the distance in miles which is significant. Moreover, the death rates of bacteria in water and the rapidity of oxidation are influenced by the temperature. In chart A these two factors of time and temperature, as they varied during a year, are graphically shown. The summer months are those in which the greatest time is permitted for the action of purifying agencies, and coincidently the temperature is, of course, higher. The section of the river represented in this chart is that in which purification may best be studied, since the pollution by the time the river water has reached Fort Foote has become well distributed throughout the cross section and by the time it has reached Maryland Point has almost disappeared.

PURIFICATION AS INDICATED BY A CONSIDERATION OF THE B. COLI COUNTS.

Since the colon bacillus has been adopted as the index of dangerous pollution from a sanitary viewpoint, a study of its progressive diminution is of interest. Figures showing this diminution downstream have already been presented in Table 12. In Chart B this diminution between the cross sections at Fort Foote and Maryland Point (the

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area of greatest purification) is shown, and if this chart be considered in connection with Chart A, the greater sanitary purification permitted by the long time and high temperature under which purifying influences can act becomes apparent. It was hoped by these studies to be able to establish constants representing the death rate of the colon bacillus, and determine with some accuracy the exact effect of the two factors of time and temperature upon them. Owing, however, to the rather small number of cases in which it was possible to collect all of the desired data, it is not felt that the results have sufficient permanent value to warrant their publication. They appeared to show that the death rate of *B. coli* was relatively delayed in the longer periods of time; in other words, that the bacilli died off more rapidly in fresh pollution, and that the death rate was accelerated by increased temperature.

From a theoretical standpoint it has been explained that considering a single bacterial species like *B. coli* and constancy in the factors of purification, the same percentage decrease (or death rate) would occur in successive equal time periods. Accordingly the death rate, or relation between the numbers of bacteria observed at successive times, could be represented by the constant K in the following formula (E. B. Phelps, 1911):

$$\text{Log.} \frac{N^1}{N^2} = KT.$$

in which N^1=the number at first observation; N^2=the number at second observation; T=time interval between observations; K=the constant factor, representing the death rate.

The rate and extent of purification as indicated by the agar counts at successive stations has already been presented in Tables 12 and 13, and Charts E, F, G, H, and I. In order to present graphically purification as shown by the distribution curves, at successive stations and times, it is necessary to resort to solid models. This has been done in figures 18 to 21, for four seasonal periods. The downward slope of the curved surface as it approaches the observer shows the reduction in the pollution with time and as one progresses downstream. The lateral curve of the surface portrays the distribution of the counts at the various stations for the season named on each figure, that is, how much the individual counts varied from one another. Thus if the surface were perfectly horizontal from right to left it would mean that all of the successive counts were identical. Elevations at the reader's left mean variations from uniformity in the direction of high counts, and depressions at the right indicate low counts. There is a rough parallelism between the lines intersecting the surface at the different

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cross sections showing the natural uniformity of distribution of bacteria at the various stations. Furthermore, in so far as the surfaces themselves are similar do they confirm the hypothesis of Phelps that the death rate of bacteria in water is identical in successive time periods, assuming constant conditions. Their departure from parallelism may indicate the entrance of disturbing factors into the problem of purification; for example, the introduction of fresh local pollution, or the unequal death rates of different species of bacteria.

A STUDY OF OXYGEN DETERMINATIONS AND OTHER CHEMICAL DATA.

Since the great bulk of pollution of the lower river consists of the sewage contributed by the city of Washington, studies of the character of this sewage were necessarily preliminary to the consideration of the purification of the lower river.

AMOUNT AND CHARACTER OF SEWAGE DISCHARGED FROM THE CITY OF WASHINGTON.

Practically all the sewage of the city is collected at the pumping station, located in the southeast section of the city, and is pumped thence under the Anacostia River to two discharge outlets, located near mid-channel at about the southern boundary of the city. The sewage system in the thickly settled section of the city is on the combined plan, and storage tanks are provided at the pumping station for the retention of storm water in excess of the normal dry-weather pumping capacity. Storm-water pumps are also provided for handling this excess flow.

Sampling technique.—During eight months, from October, 1913, regular daily samples of the sewage delivered at the pumping station have been collected. These samples were taken between the hours of 8 and 9 a. m. While the character of the sewage varies from hour to hour, so that no single sample is truly representative of the daily discharge, it has been shown, by the experiments of the Massachusetts Institute of Technology upon Boston sewage and in other moderate-sized cities with a single concentration point, that this variation is not great; the early-morning sample is approximately representative of the daily average. A portion of this daily sample has been used in making up a monthly composite, the latter being properly preserved by the addition of chloroform (about 10 c. c. per liter). A second portion of the daily sample has been submitted to routine tests for the determination of its oxygen demand. The composite samples were submitted to the ordinary procedures of

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sewage analysis for the determination of suspended solids, oxygen consumed, and the various forms of nitrogen. The methods followed have been, in general, those recommended by the laboratory section of the American Public Health Association and described in the 1912 edition of the Standard Methods of Water Analysis. Organic nitrogen determinations have been made by the method of Whipple, as described in Volume IV, Contributions of the Sanitary Research Laboratory and Sewage Experimental Station, Massachusetts Institute of Technology. The free ammonia was determined by the direct Nesslerization process of the standard methods. For oxygen consumed, the 30-minute period at boiling temperature was employed. The results are given in Table 23.

TABLE 23.—*Chemical data on Washington sewage.*

	Suspended solids.			Nitrogen as—						Oxygen consumed.
				Organic.			Ammonia.	Nitrites.	Nitrates.	
	Total.	Loss on ignition.	Fixed.	Total.	Solution.	Suspension.				
1913.										
August	41.0	20.3	20.7	5.2	4.2	1.0	6.2	0.16	0.34	45.2
September	40.7	31.2	9.5	7.5	6.5	1.0	8.5	.10	.40	31.5
October	41.0	29.5	11.5	5.0	4.6	.4	5.0	.10	.....	29.5
December	51.2	32.0	19.2	4.1	3.6	.5	8.4	.19	.44	42.0
1914.										
February	30.2	25.5	4.7	4.9	4.4	.5	5.6	.09	1.02	45.0
March	55.5	34.5	21.0	6.8	5.8	1.0	5.2	.14	1.00	50.0
April	54.0	34.2	19.8	15.2	14.2	1.0	10.8	.15	.45	47.5
May	56.7	36.5	20.2	6.8	5.8	1.0	7.2	.09	.27	42.7
Average	46.3	30.5	15.8	6.9	6.1	.8	7.1	.13	.56	41.7
ANALYSIS OF SAMPLE OF "STORM WATER."										
Jan. 26, 1914	380.0	240.0	140.0	4.5	2.5	2.0	5.5	0.00	0.06	59.2

OXYGEN DEMAND OF WASHINGTON SEWAGE.

As regards the direct effect of this sewage upon the river no useful information is given by the usual analytical determination. For this reason especial emphasis has been laid upon the oxygen relations of the sewage and the stream, the most important single feature of which is the oxygen demand of the sewage itself. Suitable dilutions of the fresh sewage were made in fully aerated tap water, the dilutions varying from 5 to 20 per cent of sewage according to the season. Seasonal changes have been shown to exert a marked influence upon oxygen demand. Whether this is a purely temperature effect or due to seasonal changes in food supply is not known. These dilu-

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tions are made in each case in duplicate, and determinations of the free dissolved oxygen are made immediately and at the expiration of a specified time. The loss in dissolved oxygen occurring in the interval gives a measure of the oxygen demand of the sewage. This loss is divided by the corresponding dilution ratio to give the oxygen demand of the undiluted volume of sewage. It has been shown that the process of oxidation proceeds in an orderly manner and at a rate which is approximately a logarithmic function of the time; that is, in equal time intervals an approximately equal proportion of the remaining oxygen demand is satisfied.[1] In the present studies, observations were made in 5 hours and again in 24 hours, in order to check the accuracy of the general formula. From the known 24-hour value and the assumed constancy of the rate of oxidation it is possible to compute the ultimate or total oxygen demand of the sewage in question.

Results.—The results of this work are summarized in Table 24:

TABLE 24.—*Oxygen demand of Washington sewage and estimated loss of dissolved oxygen in the Potomac River, in the absence of reaeration.*

Date.	Sewage flow.	Oxygen demand (parts per million).			Stream flow.	Calculated oxygen loss in stream (parts per million).		
		5 hours.	24 hours.	Ultimate		5 hours.	24 hours.	Ultimate
1913.	*Sec. ft.*				*Sec. ft.*			
September	96.1	24.6	63.7	304	2,775	0.85	2.21	10.5
October	95.1	13.8	48.6	231	10,640	.12	.43	2.06
November	89.3	7.7	25.5	121	15,314	.04	.15	.71
December	89.9	8.1	25.4	120	12,708	.06	.18	.85
1914.								
January	98.3	4.6	21.4	102	26,494	.02	.08	.38
February	99.3	4.3	18.4	88	20,494	.02	.09	.43
March	92.4	4.3	22.7	108	25,104	.02	.08	.40
April	96.4	5.6	20.8	99	25,795	.02	.08	.37
May	96.7	8.9	28.4	135	12,873	.07	.21	1.01

This table also shows the average rate of sewage discharge by months, as well as the average monthly stream flow. From these two figures the dilution of the sewage in the stream can be computed, and upon the basis of this dilution ratio and the oxygen demand of the sewage itself, the actual rate of de-aeration of the stream can be obtained. In the table these calculations of the oxygen loss in the stream are given after 5 hours, based upon the actual 5-hour determination and after 24 hours and ultimately, based upon the 24-hour determinations. The influence of seasonal conditions is strikingly shown. The ultimate demand of the sewage itself varied from 304 parts per million in September to 88 parts per million in February. The combination of high oxygen demand and low-stream

[1] Phelps, E. B., Water Supply Paper 229, U. S. Geol. Surv., 1909, p. 80.

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flow in September indicates a rate of de-aeration in the stream itself of 2.21 parts per million during the first 24 hours, as against a rate of 0.09 in February, when the demand was less and the stream flow about 10 times as great. These results illustrate a matter which has been well recognized qualitatively, namely, that maximum nuisance in polluted streams occurs during the summer season.

Since this table takes no account of the constant reaeration of the stream, the final column is essentially a statement of estimated oxygen liabilities. In order to determine to what extent these liabilities drain the oxygen resources of the river, it is necessary to estimate the latter by dissolved oxygen studies of the Potomac River water.

During the month of September, that being the month of maximum effect upon the river, dissolved oxygen samples were taken from the following stations: Three Sisters (above the city), railroad bridge, Giesboro Point, Fort Foote, Fort Washington, and Marshall Hall.

Dissolved oxygen in river in September.—At each of these stations a permanent cross section was established by ranges, and nine samples of water were taken each day for examination. These samples were taken from three stations across the stream, one being at midstream and the other two at the one-third and two-thirds point, and at each of these stations samples were collected from depths of one foot, middle depth, and bottom. The results of the examination of these nine samples were averaged to get the value at the cross section. The results are shown in Table 25.

TABLE 25.—*Dissolved oxygen results for month of September, 1913.*

Station.	Parts per million.	Temperature.	Per cent saturation.	Station.	Parts per million.	Temperature.	Per cent saturation.
Three Sisters.....	8.13	23	93.6	Fort Foote.....	4.88	24	56.6
Railroad Bridge....	6.46	24	74.7	Fort Washington..	5.94	23	68.4
Giesboro Point.....	5.31	23	61.1	Marshall Hall.....	6.01	23	69.2

It is noticeable that while the dissolved oxygen of the waters above the city is very nearly at the saturation point it decreases rapidly, reaching a minimum at Fort Foote, and then increases to about 69 per cent of the saturation value. The estimated average time of passage between the sewer outlet and Fort Foote during the month of September is five days. The oxygen depletion, computed from the data of Table 24 according to the logarithmic equation previously referred to, would be 7.14 parts per million and would leave a residue

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of 0.99 parts per million based upon the up-river value at Three Sisters. It should be noted that the intervening values are somewhat affected by the sewage discharge through tidal action. The difference between the figure 0.99 and the actually observed figure 4.88 gives an approximate measure of the rate of reaeration of the stream. This means that the river water receives about 3.89 parts per million of oxygen in five days under the condition of these observations. This reaeration factor is one of great importance in stream studies, since it determines the capacity of the stream for the oxidation of sewage.

A satisfactory check upon the methods employed in this computation was obtained by determinations of the residual oxygen demand of the polluted water at Fort Foote. Samples of this water were incubated for a 24-hour period and gave, after such incubation, an average value for the month of 4.12 parts per million of dissolved oxygen. The loss on incubation was therefore 0.76. The loss computed from the data of table 24 at the end of five days has been shown to be 7.14. Similar computations for six days give a value of 7.89. The loss between the fifth and sixth day is therefore computed to be 0.75 and actually observed to be 0.76. Similar computations for more distant points have not shown such satisfactory agreement, since the oxidation of the Washington sewage is continuously decreasing and the effect of surface and other pollutions constitutes an ever-increasing percentage error.

These results, however, have been in accord with the known facts, which indicate a constantly decreasing effect of the Washington sewage and an increasing proportional effect of the reaeration factor. A complete study of these phenomena would involve determinations of the oxygen demand of all incoming tributaries and would permit a rather precise computation of the actual magnitude of the reaeration of the Potomac River under existing or any assumed future conditions.

The expression "reaeration" is used in this discussion in its broadest sense and must include all such factors as the influence of microscopic and other plant life. The results reported elsewhere in this report show to what a large extent the green plant life is responsible for the observed aeration phenomena.

Observations in October and November.—Throughout the months of October and November similar observations were made at the Fort Foote station only. The oxygen demand, however, was not determined during these months. The dissolved oxygen for the month of October averaged 6.97 parts per million at a temperature of 16.8°, giving a per cent of saturation of 71.4. Similarly for the month of November it was 10.67 parts per million at 9°, or 91.8 per cent of

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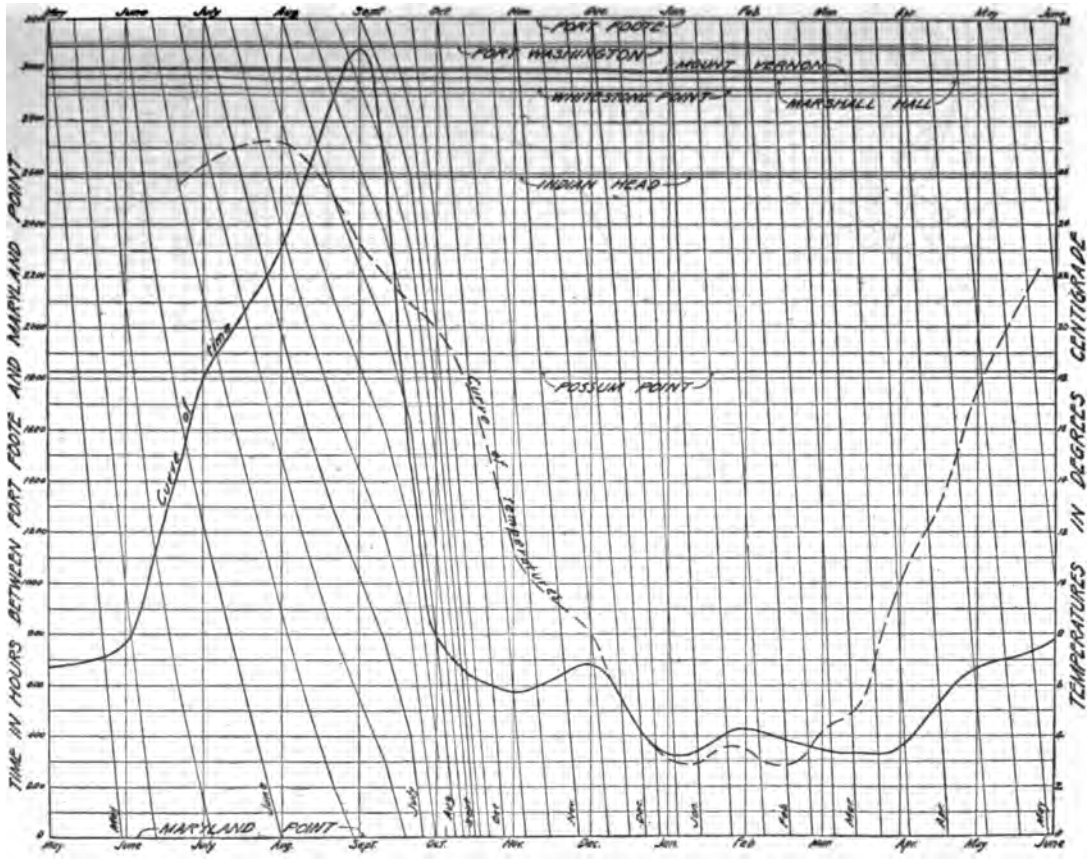

CHART A.—CURVE OF THE STREAM FLOW AND CURVES REPRESENTING THE PROGRESSIVE COURSE OF THE WATER FROM FORT FOOTE TO MARYLAND POINT, THE SECTION OF SELF-PURIFICATION.

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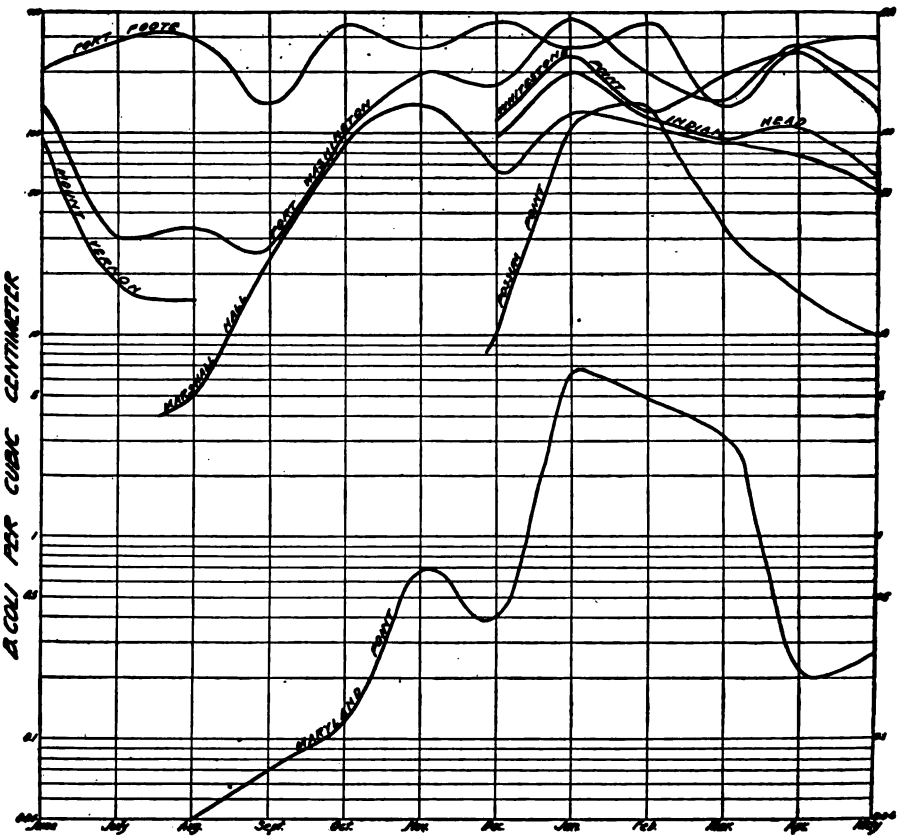

CHART B.—THE AVERAGE NUMBERS OF B. COLI, BY MONTHS, AT EACH CROSS SECTION FROM FORT FOOTE TO MARYLAND POINT.

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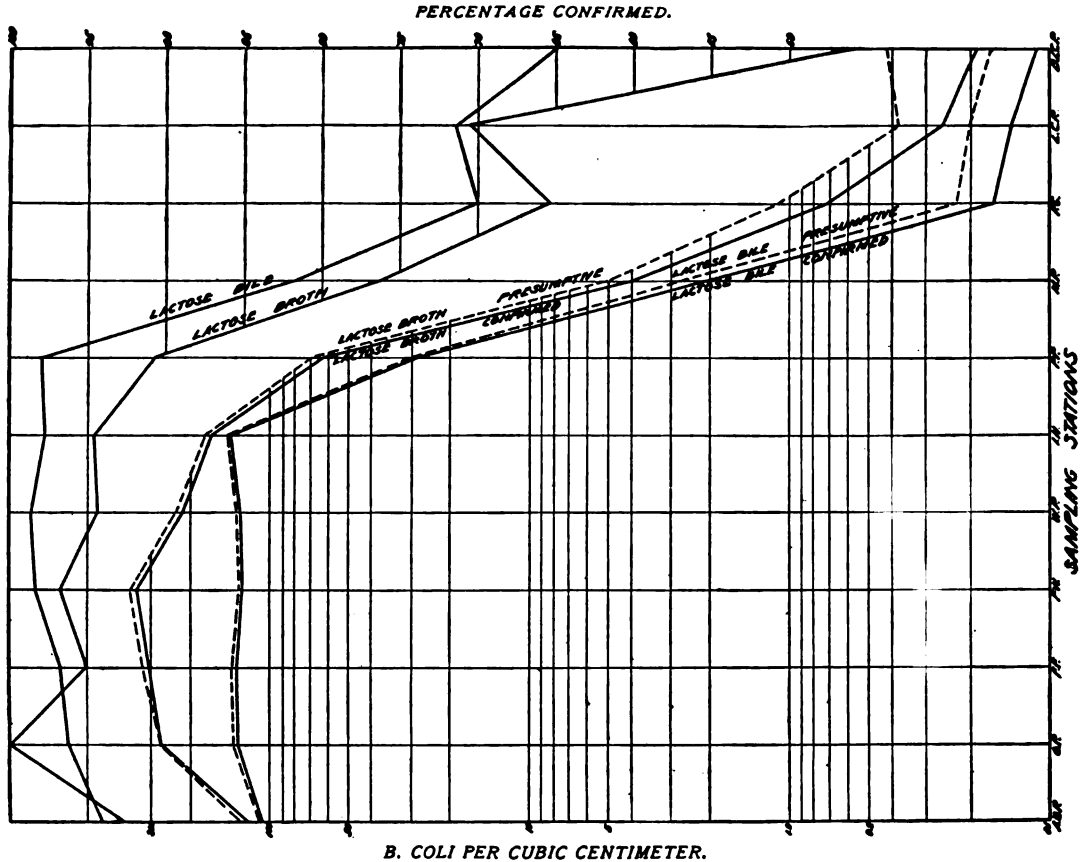

CHART C.—COMPARISON OF THE NUMBER OF B. COLI AT THE VARIOUS STATIONS, AS DETERMINED BY LACTOSE-BILE AND LACTOSE-BROTH, BY THE CONFIRMED AND BY THE "PRESUMPTIVE" METHODS.

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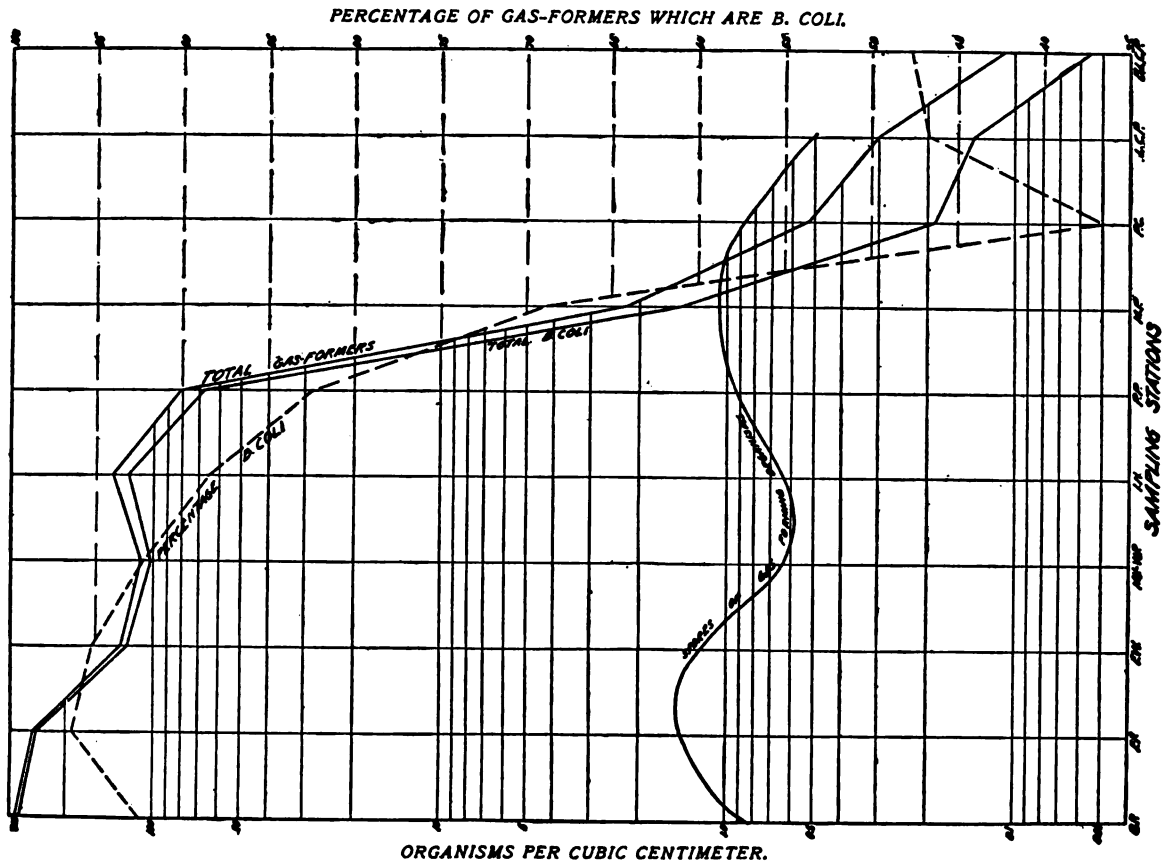

CHART D.—PERCENTAGE OF GAS-FORMING ORGANISMS WHICH ARE B. COLI.

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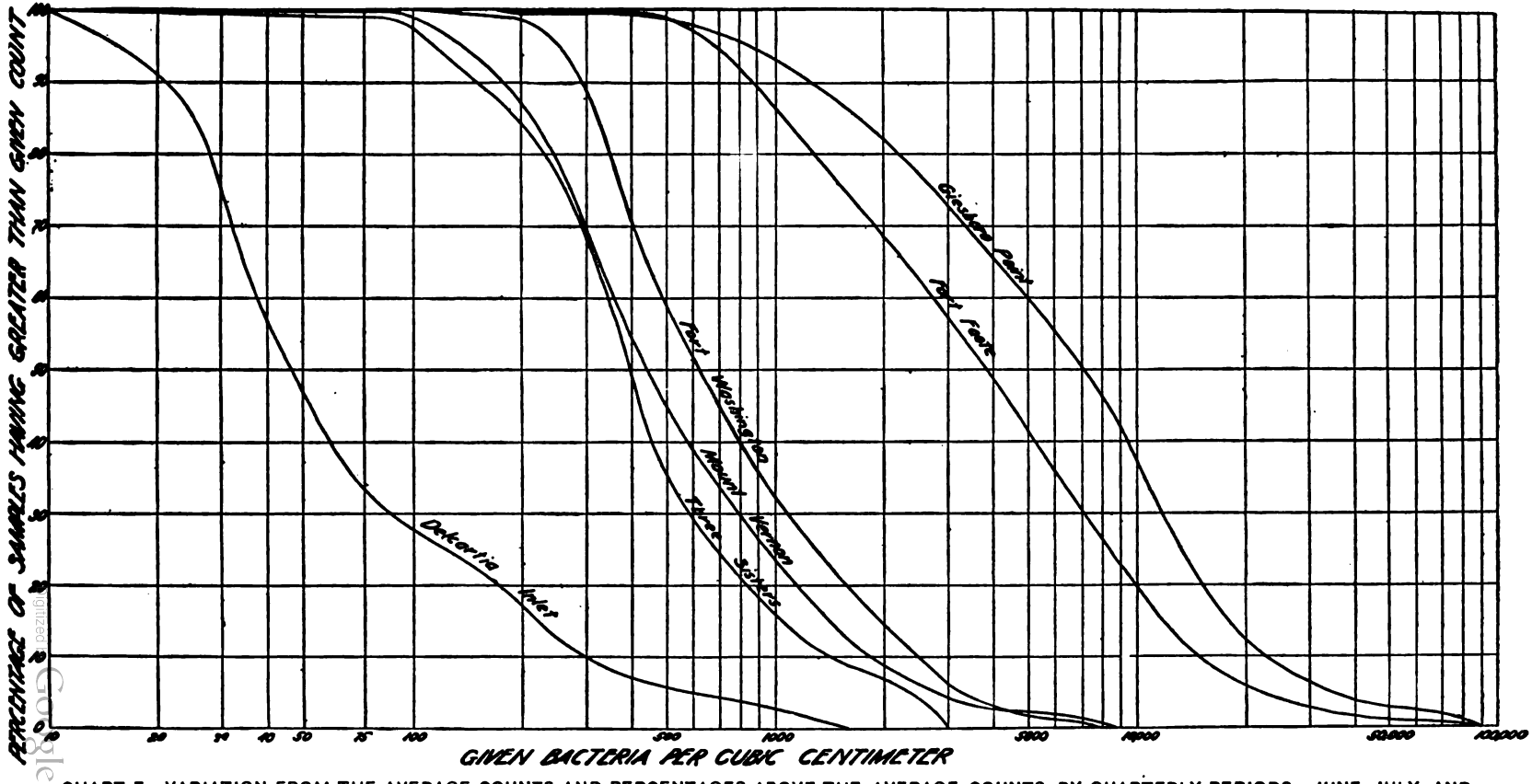

CHART E.—VARIATION FROM THE AVERAGE COUNTS AND PERCENTAGES ABOVE THE AVERAGE COUNTS, BY QUARTERLY PERIODS; JUNE, JULY, AND AUGUST.

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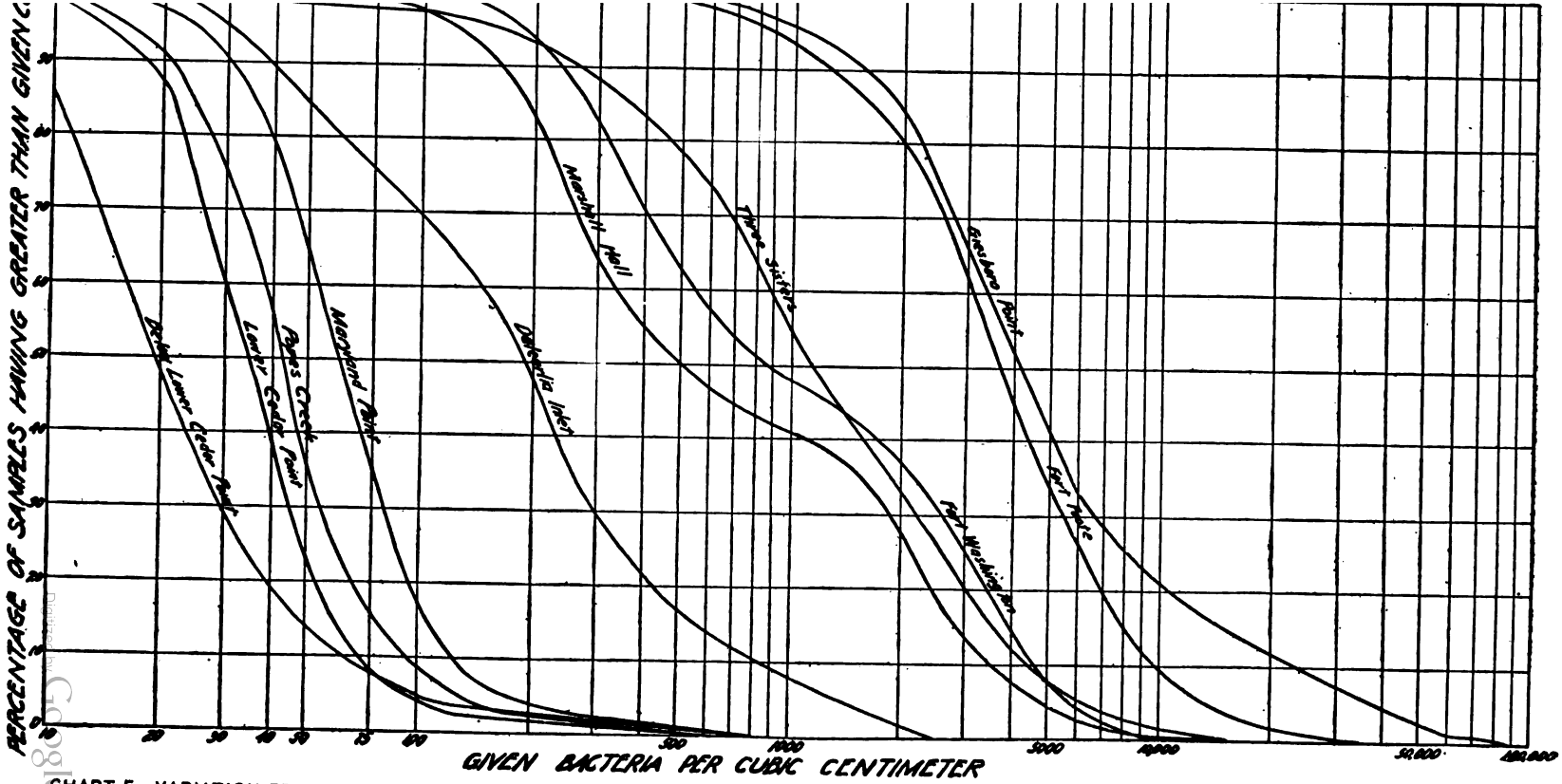

CHART F.—VARIATION FROM THE AVERAGE COUNTS AND PERCENTAGES ABOVE THE THE AVERAGE COUNTS, BY QUARTERLY PERIODS; SEPTEMBER, OCTOBER, AND NOVEMBER.

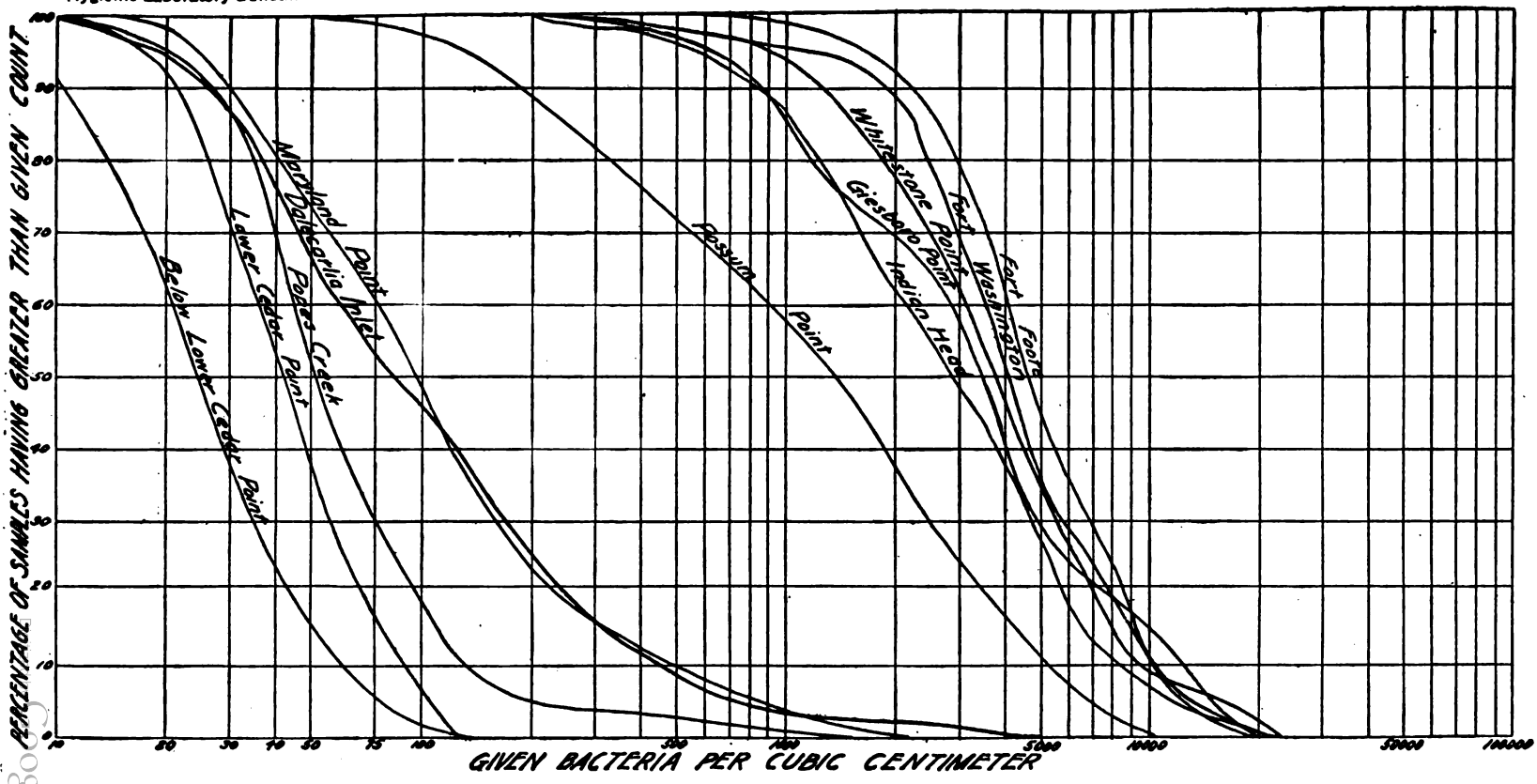

CHART G.—VARIATION FROM THE AVERAGE COUNTS AND PERCENTAGES ABOVE THE AVERAGE COUNTS, BY QUARTERLY PERIODS; DECEMBER, JANUARY, AND FEBRUARY.

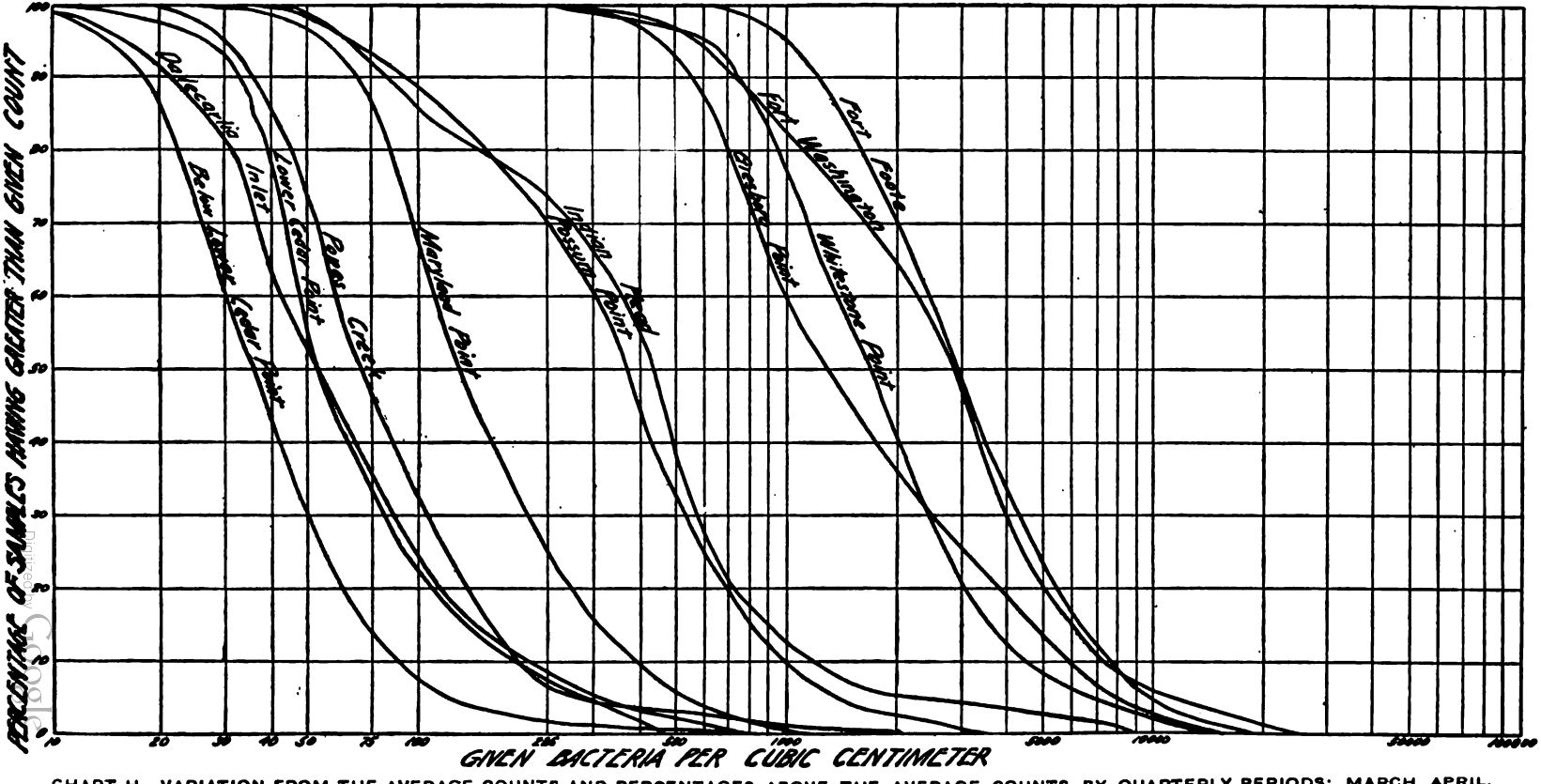

CHART H.—VARIATION FROM THE AVERAGE COUNTS AND PERCENTAGES ABOVE THE AVERAGE COUNTS, BY QUARTERLY PERIODS; MARCH, APRIL, AND MAY.

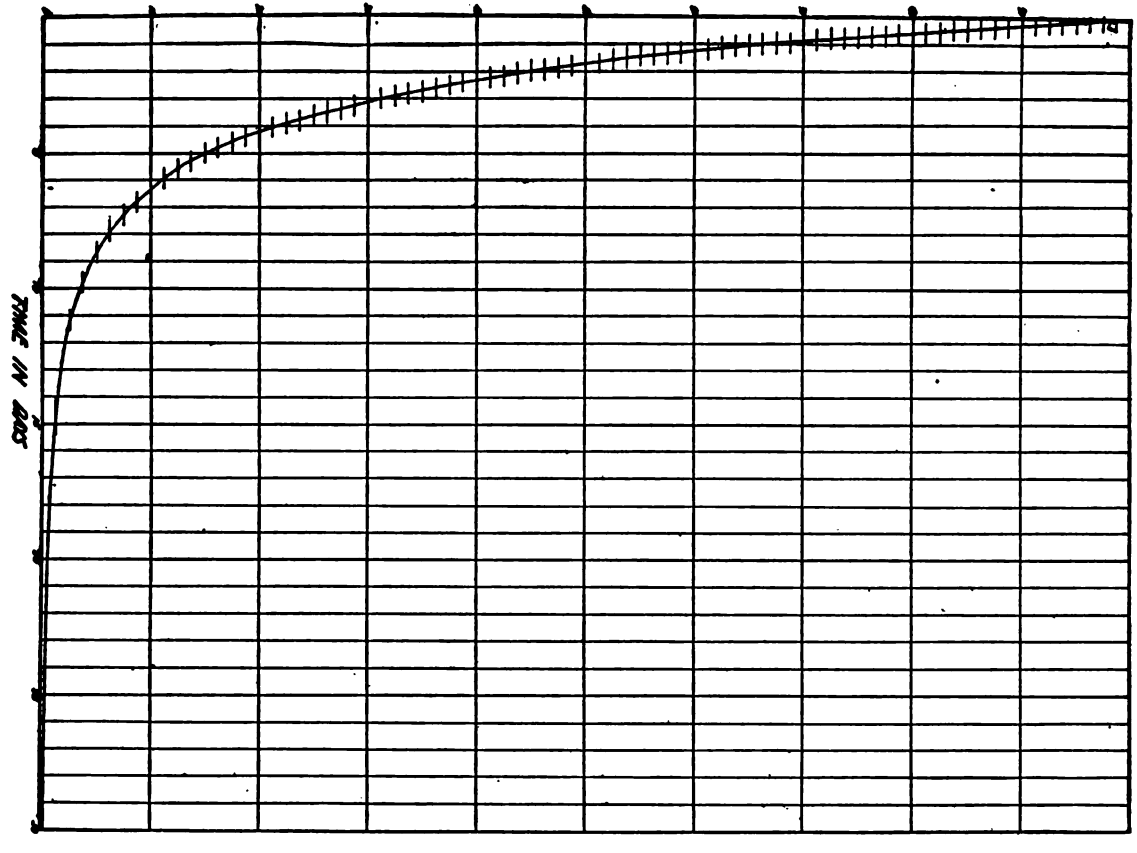

CHART I.—PERCENTAGE OF B. COLI REMAINING AFTER GIVEN TIME BELOW FORT FOOTE.

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saturation. The estimated time of passage between the sewer outlet and Fort Foote was 30 hours in October and 21 hours in November. From the data of Table 24 it is calculated that the oxygen depletion in the month of October would have been 0.51 and in November 0.13 parts per million. The actual condition of the river above the city was not determined during these months, so that no actual computations are possible; but it may readily be seen in a general way that a very close correlation exists between the computed oxygen demand of the Washington sewage and the actual observed conditions at the Fort Foote cross section.

Oxygen saturation in critical area.—The most significant figures derived in these studies are those giving the per cent of oxygen saturation in the critical area of the river (Table 25). These show that even at that period of the year when the purifying resources of the river are most taxed they still maintain a balance over the liabilities. This balance is reduced critically at the Fort Foote cross section, but a few miles farther downstream has again become restored well above the point where the danger of nuisance need be considered.

In order that a river may cope successfully with pollution introduced it must have sources from which its oxygen may be constantly replenished. This, of course, is ever present in the air which bathes the surface of the stream, but the rate at which the water can acquire oxygen from this source is limited, and if the pollution be great may require a prohibitive period of time. The Potomac River has, as has been said, an enormous source of oxygen in the vegetation which grows in the natural tidal basins or "flats" which border its lower portion. A further discussion of oxygen in combating pollution will be found in the following article which, on account of its consecutiveness, has been embodied as a separate section of the report, although it deals largely with the subject of the self-purification of the river.

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POTOMAC PLANKTON AND ENVIRONMENTAL FACTORS.

BY W. C. PURDY.

This report is not confined to the activity of the Plankton as such. Manifestly there can be no sharp line of demarcation, as to activity, between the unattached or floating organisms (the Plankton proper), such as *Scenedesmus* or *Protococcus*, and the attached *Coleochaete* or *Oscillatoria* in the immediate vicinity; nor between the free-swimming *Paramoecium* or *Rotifer*, and the *Tubifex*, or *Spongilla* attached, but in the same immediate locality and affecting the same water. A given body of water is subject to many biological influences, not only those incident to the life of freely floating organisms, but also those of the attached forms, such as the larger Algæ, the Potamogetons, Ceratophyllums, Eelgrasses, and various other submerged plants; also the snails, mussels, leeches, turbificid worms, larvæ, etc., which may populate the bottom mud.

Channel and flats.—Biologically and physically, the Potomac below Washington is divided into (1) channel and (2) flats (see map No. 7). The channel is relatively narrow and deep, the water usually more or less turbid and in constant motion, either by reason of current or tides, or both. Conditions are different on the flats. From the latter part of May to November this shallow water contains a marvelous growth of submerged vegetation which checks the movement of turbid, flood-tide water from the channel, causing it to drop its sediment, so the water on the flat is nearly or quite clear, even when a flood of muddy water is passing down the river channel. The dense vegetation also forms sheltered retreats for young fish and for many forms of small aquatic life, and the practically motionless water here affords sufficient time for breeding of these microscopic organisms. In some cases sewage is discharged into the water of these flats, as is the case with Hunting Creek Flat, just below Alexandria.

The tides.—The tides affect the lower river profoundly. The flood tide checks the current, reversing the direction of its flow for a time and spreading the water over the flats, thus causing extensive sedimentation, mingling the turbid water of the channel with the clear water of the flats and thoroughly mixing any sewage in the river with a very large amount of water.

The general effect of the ebb tide is a partial reversal of the conditions just stated. The outgoing tide augments the normal down-

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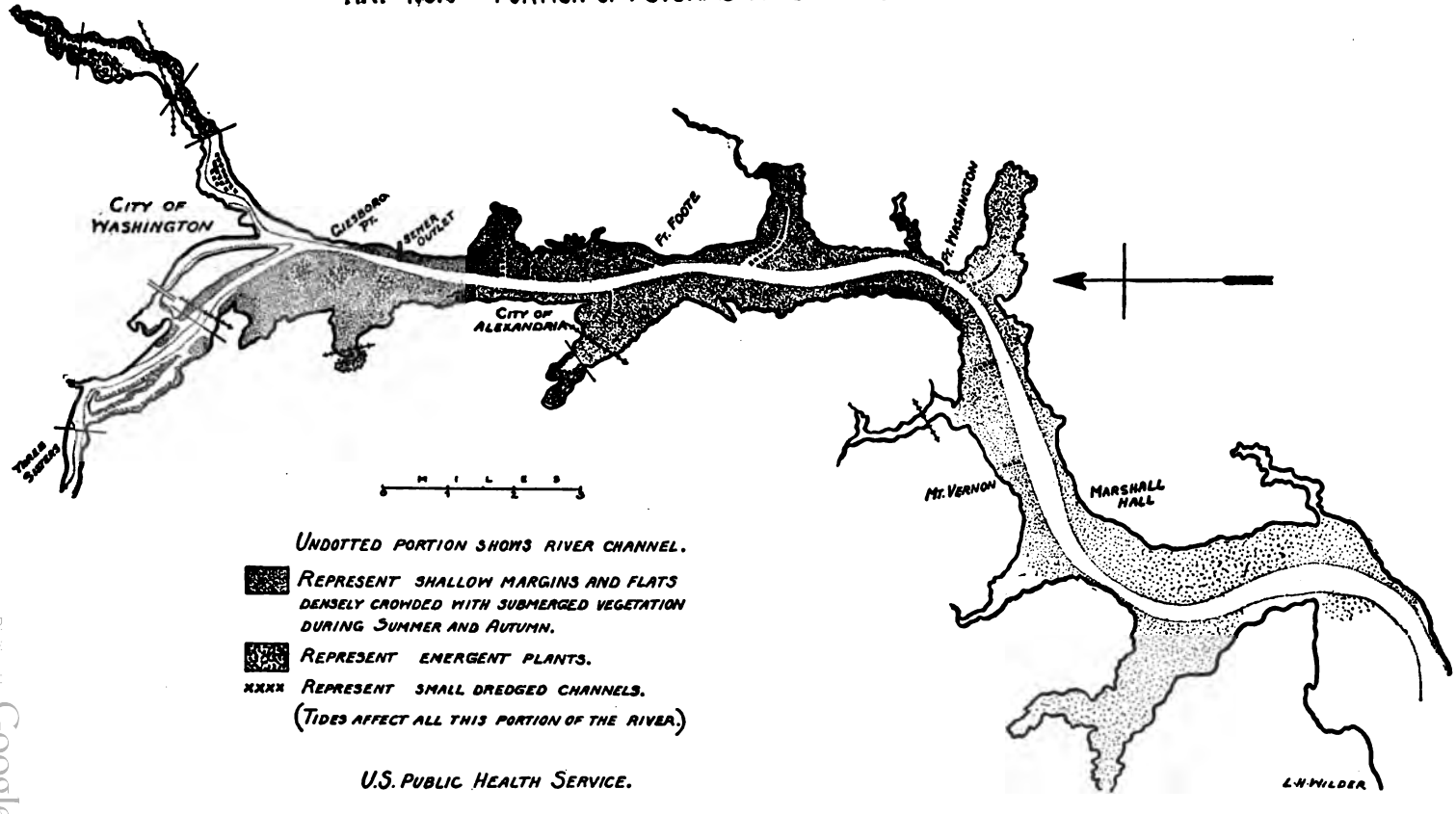
MAP No. 7 - PORTION OF POTOMAC RIVER AT LOW WATER.



UNDOTTED PORTION SHOWS RIVER CHANNEL.

REPRESENT SHALLOW MARGINS AND FLATS DENSELY CROWDED WITH SUBMERGED VEGETATION DURING SUMMER AND AUTUMN.

REPRESENT EMERGENT PLANTS.

xxxx REPRESENT SMALL DREDGED CHANNELS.

(TIDES AFFECT ALL THIS PORTION OF THE RIVER.)

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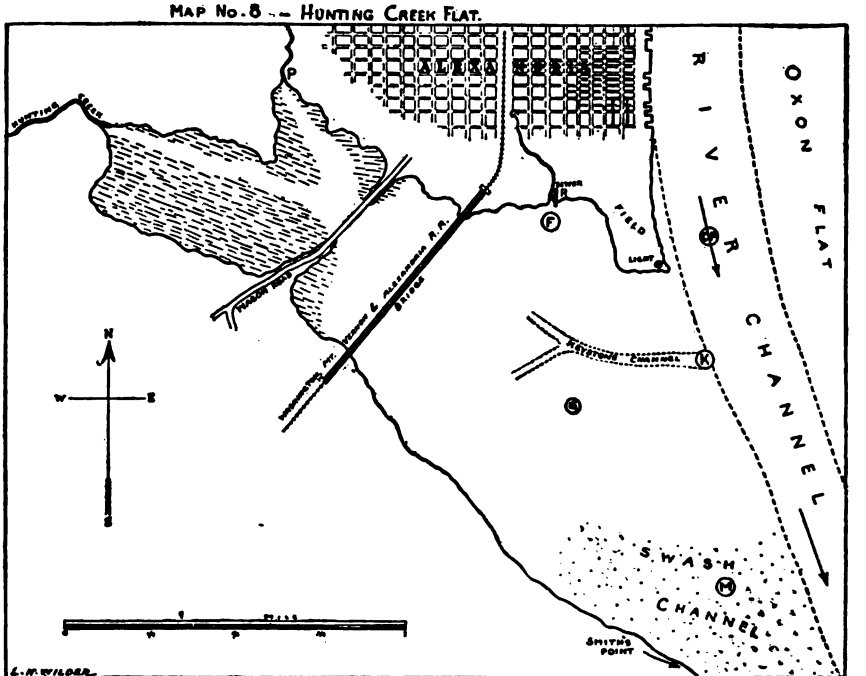
MAP No. 8 — HUNTING CREEK FLAT.



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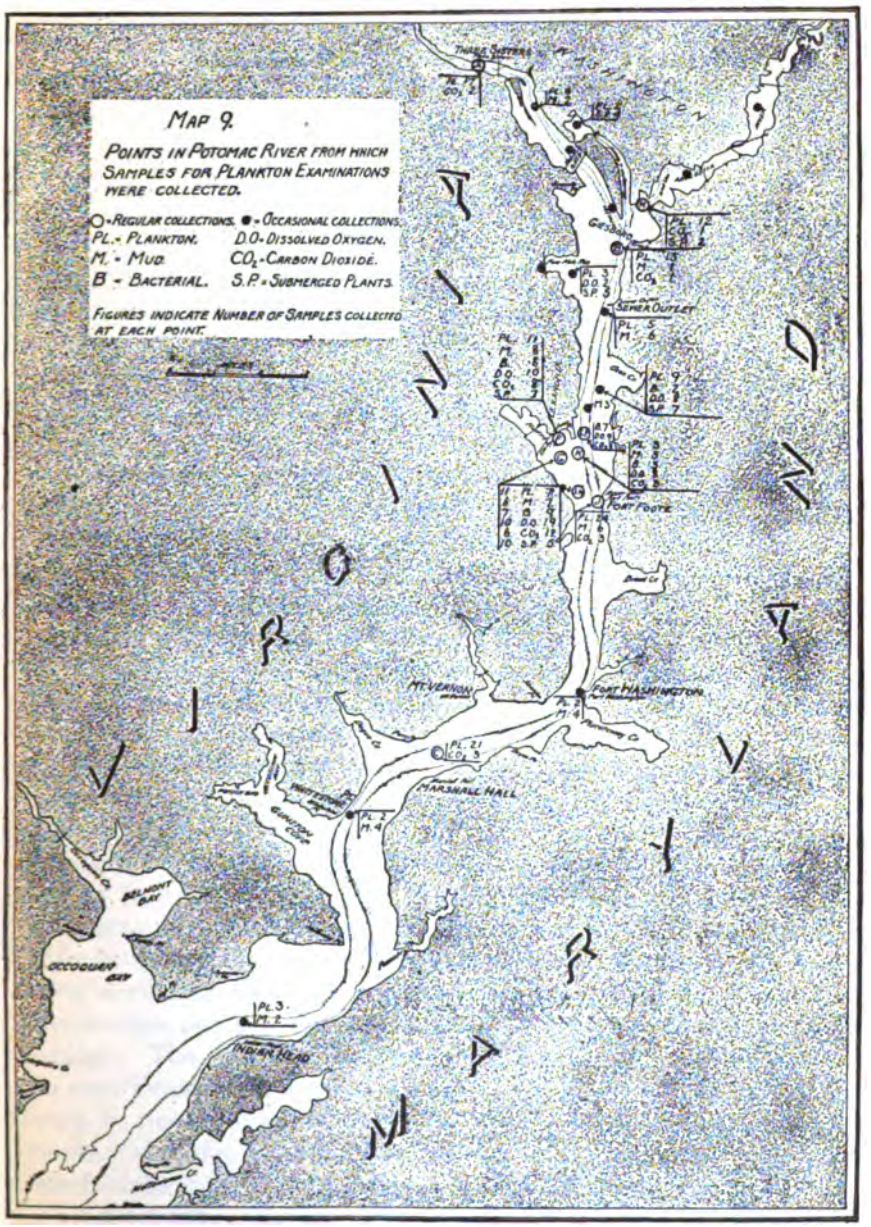
MAP 9.
POINTS IN POTOMAC RIVER FROM WHICH SAMPLES FOR PLANKTON EXAMINATIONS WERE COLLECTED.
○ = REGULAR COLLECTIONS. ● = OCCASIONAL COLLECTIONS.
PL. = PLANKTON. D.O. = DISSOLVED OXYGEN.
M. = MUD. CO_2 = CARBON DIOXIDE.
B = BACTERIAL. S.P. = SUBMERGED PLANTS.
FIGURES INDICATE NUMBER OF SAMPLES COLLECTED AT EACH POINT.
THREE SISTERS
GEORGETOWN
SEWER OUTLET
FORT FOOTE
FORT WASHINGTON
MT. VERNON
MARSHALL HALL
BELMONT BAY
OCCOQUAN BAY
INDIAN HEAD

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stream current for a few hours and drains the flats of water which in summer and fall is cleared and oxygenated, and during winter and spring is usually much more turbid than the channel water. At ebb tide these flats become tributaries of no small significance, the sum total of their contribution in a given year being very great.

Thus the river as a whole, represented by the main channel, will be profoundly affected by the character and amount of water from these contributing flats, the effects being physical, chemical, and biological.

The tides produce the effect of greatly increasing the length of the river, inasmuch as the direction of the flow is usually reversed by the flood tide, the water flowing upstream for a time. Thus, the time required for water to flow a given distance downstream is greatly increased. Float experiments during this investigation show that water passes and repasses certain points several times, its net progress downstream between Washington and Mount Vernon, for example, being an average of less than 3 miles per day, but its total movement back and forth with the tides amounting to many miles per day. It will thus be seen that in a given length of the river, as from the sewer mouth to Dogue Run, 13 miles, the total distance traversed by the water back and forth is in all probability several times the actual distance between the two points.

Union of Potomac with Chesapeake Bay.—It seems probable that the river as such does not extend to the point where the Potomac water unites with Chesapeake Bay, but that the actual river mouth is somewhere in that portion between Indianhead and Colonial Beach and that all the lower portion is simply an arm of Chesapeake Bay. Its character as a river has been obliterated by the predominating characteristics of a bay.

Principal pollution.—The untreated sewage of Washington is pumped into the channel at a point about 3 miles below the city. The average daily amount of this sewage is about 60,000,000 gallons. This constitutes the principal pollution to be considered, although a few sewers in Georgetown, emptying into the canal, contribute some sewage, and a few storm-water sewers add street washings and drainage. The city of Alexandria, Va., 5 miles below Washington, also contributes its untreated sewage to the water of the river. It should be noted, however, that much of the Alexandria sewage enters the water of a large flat just below that city, at two points, about three-fourths mile and 1¼ miles, respectively, from the channel of the river proper. (See map No. 9.) This flat has an area of about 1⅓ square miles, with 2 to 5 feet of water at low tide. The sewage that flows upon this flat will necessarily be subjected to certain physical, chemical, and biological actions by reason of the wide expanse of

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shallow water, with very slight movement, and densely crowded with submerged plants during summer and autumn. It is possible that this sewage, as such, disappears before reaching the main channel, and therefore adds no polluting material to the river.

The upper Potomac has not been subjected, when it reaches Washington, to any appreciable recent pollution.

Oyster industry.—The lower Potomac is much used for boating. Fishing also is an industry of considerable importance. Oyster fishing in the salt-water portion of the lower river is a large and increasing industry. The great value of these oyster beds naturally brings up the question of possible injury to them by the sewage and wastes in the Potomac River. With a view to obtaining light on this question samples of water were examined to ascertain the number and kinds of microscopic free-floating plants and animals, collectively termed the "Plankton," which are normally present in Potomac water, and to determine as far as possible the mutual effects and reactions between these organisms and the sewage. The complex and intricate conditions of tide, current, turbidity, sunlight, physical conditions, and chemical content which obtain in different parts of the Potomac constitute some of the factors in this problem of which the Plankton content is in part the biological expression. This biological work was carried on simultaneously with the main bacteriological and chemical investigation.

The varying physical and biological conditions in the Potomac produce a number of well-marked "biological situations." With reference to these, our collecting places or "stations" were chosen for the study of the river as a whole.

EQUIPMENT FOR FIELD WORK.

METHODS.

Collections from the river channel were made from the tug *Virginia* or from the steamer *Bratton*. A half-inch hose, 50 feet long, weighted, and screened at one end and connected at the other end to a small centrifugal pump, enabled us to secure a representative "vertical" section of water by slowly raising the hose from the bottom as the pump was worked. This sample was delivered into a clean bucket, mixed, and 4 liters filtered through a Sedgwick-Rafter filter. Collections on the flats were made by using an 18-foot rowboat equipped with sail. In the absence of hose and pump a 4-liter collecting bottle, arranged on a two-piece 10-foot pole, was thrust to the bottom of the water and raised to the surface as it filled with water. This outfit was sometimes used instead of the plankton pump in the river channel. (Fig. No. 16.)

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Plankton samples.—Plankton samples were filtered at once. To accomplish this a combined filtering stand and field kit was constructed containing suitable apartments for collecting bottle, reagents, sand, sample bottles, etc. Samples were concentrated by the Sedgwick-Rafter filter to 10 or 15 cc., and the catch killed by addition of enough alcohol to make a 50 per cent solution. At the laboratory the catch was allowed to settle until the next day, when part of the alcohol was removed with a pipette and enough 95 per cent alcohol added to the catch to bring the contents up to about 70 per cent strength. In this the catch was preserved.

Catches from the lower river were preserved by adding a little 40 per cent formalin. It was found that preservation by use of alcohol caused the formation of crystals, probably from some salt in solution in the water, but insoluble in alcohol.

The volume of the catch was measured by centrifuging in graduated tubes, at a medium rate of speed, until the supernatant liquid was clear. This required, usually, 1½ to 2 minutes, depending somewhat on the character of the catch. In all cases careful note was taken of any irregularity in the surface of the centrifuged material, such as the depression in the center, and the volume recorded was duly corrected if necessary.

Counting was done by use of the Sedgwick-Rafter cell and an ocular micrometer ruled in squares. After careful but thorough shaking, 1 cc. of the catch, diluted if necessary, was placed in the cell in the usual manner and 10 fields counted. As each field was examined the relative amounts of plankton organisms, as compared with the silt and amorphous matter in the field, were carefully estimated and expressed in standard units at the bottom of the column representing that field. The two averages, one of plankton and the other of amorphous matter and silt, plus the plankton of the 10 fields, were then taken, and this ratio expressed in per cent used in determining the volume of actual plankton, from data obtained by centrifuging the catch. Thus, if the average of 10 fields is 20 standard units of plankton and 480 standard units of amorphous matter and silt (the layer of material in the counting cell being of uniform thickness), the actual plankton is $\frac{20 \times 100}{(480 + 20)}$ per cent of the volume obtained by centrifuge, or 4 per cent.

Other samples.—Samples to determine the amount of dissolved gases (O and free CO_2) were taken on the flats. A few bacteriological samples were taken at these points also, as the regular daily collections by the tug *Virginia* or the steamer *Bratton* could not cover these stations in the shallow water. Mud samples were collected from both channel and flats during the spring of the year, and various

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aquatic plants were collected during their respective seasons of activity.

Mud samples were examined on arrival at the laboratory, the findings being entered under the following headings: Color, odor, consistency, animals present, plants present, organic remains. (See Table 27.)

The total number of each kind of samples taken at various stations is tabulated in Table 26.

TABLE 26.—*Potomac River investigation biological samples (Georgetown to Indian Head).*

Station.	Number of samples.							
	Symbol.	Plankton.	Mud.	Bacteria.	Dissolved oxygen.	Free CO_2.	Submerged plants.	Total.
Three Sisters	A	17	.....	.....	.....	2	.....	19
Giesboro Point	B	13	1+	.....	.....	1	.....	15
Mount Vernon or Marshall Hall	C	21	.....	.....	.....	3	.....	24
Flat below Alexandria (near sewer)	F	11	8	8	10	8	7	52
Flat below Alexandria (mid flat)	G	11	6	7	10	6	10	50
Mouth of Anacostia River	H	12	.....	.....	.....	1	2	15
Fort Foote	J	24	6	.....	.....	3	.....	33
Keystone Channel below Alexandria	K	3	3	3	8	3	3	23
Smiths Point (flat below Alexandria)	SM	7	7	9	19	12	5	59
Channel near lighthouse below Alexandria	CP	.....	.....	7	9	8	.....	24
OCCASIONAL SAMPLES.								
Flat of Four Mile Run	D	3	.....	.....	2	.....	5	10
Flat of Oxon Run	E	9	.....	2	8	.....	7	26
Foot of Seventeenth Street	L	4	2	.....	.....	.....	.....	6
Near sewer discharge (river channel)	SS	5	6	.....	.....	.....	.....	11
Sewer near canal, Georgetown	.....	.....	7	.....	.....	.....	.....	7
Tidal Basin	.....	2	.....	.....	.....	.....	4	6
River channel, opposite Alexandria	.....	.....	3	.....	.....	.....	.....	3
Fort Washington	.....	2	4	.....	.....	.....	.....	6
Whitestone Point	.....	2	4	.....	.....	.....	.....	6
Indianhead	.....	3	2	.....	.....	.....	.....	5
		149	59	36	66	47	43	400

Mud samples were secured from the river channel by means of a simple conical scoop with bail or handle long enough and heavy enough to insure its proper position for scraping the mud surface on reaching the bottom. This scoop was then dragged a few feet, engaging the mud similar to the action of a "mushroom" anchor. A representative sample of about 200 cc. of this mud was transferred to the laboratory and examined. Other than this no effort was made to examine the mud quantitatively. Mud samples were secured from flats by usé of a simple scoop on the end of a pole (fig. No. 16).

From August to December, 1913, and during April and May, 1914, weekly samples were taken at regular stations, although considerable irregularity was caused by extreme turbidity, which made it impossible to get water through the Sedgwick-Rafter filter in sufficient amount to furnish a reliable sample.

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Condition of river in winter and early spring.—During winter and early spring the flats were inaccessible on account of ice, and the channel waters were too turbid for the collection of samples during portions of the same season. After the ice disappeared the shallow water on the flats, having as yet no plant growth to protect it, was kept stirred up and turbid by wind, but the channel water was relatively clear, except when the ebb tide drained a flood of muddy water into it from some wind-disturbed flat.

Owing to these conditions the samples as taken were somewhat irregular as to sequence, considering the ten months' investigation as a whole. However, the majority of samples were taken, so far as possible, at the season of greatest plankton activity, and all samples were taken, filtered, preserved, and examined with due precautions to eliminate any source of error in order that each sample might be a true index of the plankton content of the water concerned.

Species of organisms.—The limited time assigned for this investigation, combined with the great difficulty of identification to a certainty of preserved organisms, seemed sufficient justification of our course in not stating as a rule the species or variety. It seemed more important, from a practical point of view, to ascertain why certain organisms were present and others absent, why they were few or abundant, and to interpret these findings in terms relative to the condition of the water. In other words, an effort was made to use the plankton content, and the bottom forms as well, as a pollution index, following in this respect the general plan of the excellent report on the Biology of the Upper Illinois River,[1] by Dr. S. A. Forbes and Prof. R. E. Richardson. These gentlemen distinguish three stages of impurity by applying to water and its characteristic biological content the terms: (1) Septic or saprobic, (2) polluted or pollutional, (3) contaminated or contaminate, and, (4) finally, "clean water," the terms as given being in the order of diminishing impurity. We have attempted in the following table to associate these terms with the physical, chemical, bacteriological, and biological conditions of water that corresponds thereto:

[1] Bull. Ill. State Lab. of Natural History, Vol. IX, Art. X, June, 1913.

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Characteristics.

Water.	Physical.	Chemical.	Bacteriological.	Biological.
Septic or saprobic.	Water discolored with suspended matter, sewage, and microscopic organisms. Offensive odor. Bubbles of gas arising from bottom. Sticky, dark-colored mud, with offensive odor.	Dissolved oxygen low, ranging from 0 to 20 per cent of saturation. High CO_2 (free) as a result of decomposition. Very high ammonias and nitrites. Nitrates low or absent.	Very high 20° count. *B. coli* in one ten-thousandth c. c. or less.	Persistent presence of Infusoria in large numbers. (*Paramoecium*, *Colpidium*, *Carchesium*, *Epistylis*, etc.) Microscopic worm *Dero* often present. Fungi such as *Saprolegnia*, *Leptomitus*, *Beggiatoa*, and *Sphaerotilus* are usually the only plants present. Mud contains many "slime worms," such as *Tubifex* and *Limnodrilus*.
Polluted.	Discoloration and offensive odor only occasional. Bubbles only in warmer weather. Bottom mud dark, somewhat sticky, with some offensive odor.	Dissolved oxygen may range from 15 to 60 per cent of saturation. Free CO_2 is high, about 5 to 10 parts per million. Ammonias and nitrites high.	Bacterial count high. *B. coli* present in one-tenth to one-thousandth c. c. as a rule.	Smaller protoza such as *Difflugia*, *Anthophysa*, *Vorticella*, etc., are present, also certain rotifers and small crustaceans. Prevailing plants are the blue-green algæ, also *Beggiatoa* and certain diatoms. Mud contains slime worms, and sometimes snails and young mussels.
Contaminated.	No discoloration, odor, nor bubbles from bottom. Accumulated bottom mud granular rather than sticky, and with no offensive odor.	Dissolved oxygen is uniformly high, about 70 to 100 per cent of saturation. Moderate amount of ammonias and nitrites with high nitrates. Free CO_2 varies from 2 to 6 parts per million.	Count at 20° moderate, ranging from 100 to 5,000 per c. c. *B. coli* in 1 c. c. and sometimes in one-tenth c. c.	Characteristic animals are green flagellates, such as *Englena viridis*, *Phacus*, etc., with crustaceans (*Cyclops*, *Grammarus*, etc.) in moderate numbers. Sponges and Bryozoa may be attached to sticks, plants, or pebbles. Unicellular and filamentous green algæ are usually present. Blue-greens are occasional. Diatoms are numerous. Bottom mud contains mussels, snails, and larvæ of insects.
Clean.	No discoloration, odor, nor bubbles. Accumulated mud on bottom is without special odor, may be light or yellowish in color, and is not sticky.	Dissolved oxygen is usually at the saturation point. Ammonias and nitrites are very low or absent. Nitrates may be high or low. Free CO_2 about 1 to 2 parts per million.	Total count at 20° may range from 100 to 1,000 per c. c. *B. coli* usually present in 10 c. c., but not in 1 c. c.	Microscopic animals are few, consisting chiefly of a few rotifers and constaceans. There is a noticeable absence of septic and pollutional organisms. Many diatoms may be present, especially *Navicula*. Green algæ in moderate amounts are along edges of stream. Clean bottom is populated with larvæ of stone fly, May fly, etc., also mussels and crayfish may be present.

THREE SISTERS.

This station, a short distance above Aqueduct Bridge and opposite Georgetown, was chosen because the water has not yet been contaminated by sewage from either Georgetown or Washington, although a small amount of pollution is introduced by the intermittent overflow of the Chesapeake & Ohio Canal, into which a few small sewers and at least one large one discharge.

This is the lower end of the narrow, turbid, swift upper Potomac, the "young" portion of the river. Moreover, the water here has not yet had access to the flats which characterize the lower river below

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Washington. The raw, turbid water is as yet untreated by these vast aeration and sedimentation basins.

Plankton samples (see Figs. 22 to 53).—During August, 1913, these showed 4,500 diatoms per liter of water. Blue-green algæ amounted to 2,100 standard units per liter. (There are 2,500 "standard units" in 1 square millimeter, or 1,562,500 in 1 square inch.) The green algæ slightly exceeded the blue-green in amount. Rhizopods were present in small numbers, about 250 per liter. Infusoria averaged 250 per liter and rotifera 112.

The organisms in this list that would arouse suspicion as to the purity of the water are the blue-green algæ, the rhizopods, and the infusoria. The latter, however, were composed almost wholly of *Codonella*, which Prof. Kofoid[1] regards as indifferent to sewage or not dependent on the presence of sewage organisms for food.

The river is comparatively narrow at this point, and the limited overflow from the contaminated canal and other local pollution would seem to be sufficient explanation for the presence of small amounts of blue-green algæ and small numbers of rhizopods, especially as some of the samples were collected during flood tide, when the marginal waters would be more perfectly mixed with the channel waters.

September samples contain per liter of water organisms as follows: Diatomaceæ, 5,200; blue-green algæ (unicellular), 2,200; fungi (*Crenothrix*), 1,300 standard units; rhizopods, 200; mastigophora, 420, chiefly *Euglena viridis* and *Trachelomonas;* infusoria, 330, principally *Codonella* and *Halteria.* A few crustacea (*Cyclops*) were found, the majority being in the nauplius stage. *Anguillula*, a microscopic worm, was present in small numbers in one sample.

The presence of organisms in number and kind essentially the same as were found during September would seem to indicate that the water was still occasionally affected by small quantities of pollutional material, not sufficient, however, to give rise to a rapid increase of those organisms that find their food in organic matter. The persistent presence of large numbers of *Euglena viridis*, for example, would be just ground for suspicion, because they multiply rapidly in water rich in organic matter. The small number of these organisms in the water would tend, therefore, to demonstrate that the water is reasonably pure.

October showed about the usual number of diatoms (4,800) until October 21, when a considerable increase was noted. This increase was made up chiefly of *Nitzschia*, of which there were 46,000 per liter, running the total diatom count up to 55,000. Very few organ-

[1] Bull. Illinois State Lab. Nat. Hist., Vol. VIII, Art. I, p. 122.

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isms other than diatoms appeared in this sample, with the exception of a unicellular green alga, *Protococcus*, which numbered about 2,000. Another catch taken October 16 showed a few *Arcella*, a rhizopod which normally inhabits the bottom ooze, but occasionally is buoyed up gases or disturbed by water currents, hence its occasional presence in the plankton or floating organisms. None of the organisms mentioned would arouse suspicion as to the condition of the water. The plankton population seems to be that of a water of average degree of purity or better.

Three collections were made in November—the 4th, 18th, and 25th, respectively. The turbidity of the three samples was 55, 150, and 45, respectively, with temperatures of 11°, 8°, and 10°. It is probable that the disturbed hydrographic conditions resulting in the high turbidity of November 18 were largely responsible for the considerable fluctuation shown in the diatom content, that of November 4 being 3,000 per liter, the count increasing to 72,000 (chiefly *Navicula* and *Synedra*) in the sample taken November 18, and falling again to 9,000 (largely *Pleurosigma*) November 25.

Blue-green algæ, chiefly isolated strands of *Oscillatoria*, were present in two of the collections. This plant normally grows in mats on the bottom or in shallow water along the edge. Currents caused by floods, or otherwise, or gases generated in the bottom mud will from time to time break up these mats and distribute the small masses of filaments through the upper water, hence the advent of a few of the detached threads in the plankton of the main channel. Normally this plant flourishes in sewage-polluted water. The source of the specimens found in these samples was probably in the polluted water from the canal, or from some small local sewer whose further effect would be unnoticed in the large amount of dilution water.

Difflugia, usually living in bottom ooze or in slimy material on plants, was present in the November 18 sample, about 4,000 per liter. Its presence is of doubtful significance, so far are present knowledge extends, except that its appearance on this occasion was coincident with the disturbed conditions in the river due to rains, and, further, an important factor in its food supply, viz, diatoms, were especially abundant at this time. There had been much rain during November 14, 15, and 16, resulting in a turbidity of 150 when the sample was taken. It is noticeable that this organism did not appear in the collections of November 4 and November 25. In both of these cases turbidity was low, 55 and 45, respectively, there having been no rain for more than a week preceding each collection.

In two samples *Codonella* was found, November 4, 1,000 per liter, and November 25, 5,000 per liter. The food of this organism is sup-

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posed to consist chiefly of minute algæ.[1] A minute worm, a nematode as yet unidentified by the writer, was present in this sample.

The evidence derived from these November samples is on the whole favorable, with the possible exception of the organism just mentioned. However, as this nematode was found only in the sample which had been subjected to the disturbed hydrographic conditions and high turbidity, its presence may have been due to the disturbance of decaying plants on which or in which the animal lives or feeds.

Ice and high water prevented collections at this station during winter and early spring. Samples were obtained in March and April, 1914, the last being taken April 13.

The plankton in March consisted mainly of 50,000 diatoms per liter, of which 28,000 were *Synedra*. A few filaments of blue-green algæ were present. No other organisms appeared in significant numbers.

The water in April again showed a majority of *Synedra* (12,000) in the diatom count of 20,500 per liter. *Cladophora*, a green alga normally growing attached to stones, etc., in riffles and in shallow moving water, was present in small amount, probably torn loose from its moorings. The infusorian *Codnella* numbered about 500 to the liter.

It will be seen that the plankton content of the water in March and April showed nothing that would indicate more than a small amount of pollution. It should be noted, however, that the occurrence of the diatom *Synedra* in great numbers is regarded by some workers as an indication of contaminated water.

A certain combination of flood-tide and wind conditions will, in some instances, bring to this sampling point some of the highly polluted water from the wharves, and from the outlet of the canal, located a few hundred yards downstream.

Fish are fairly plentiful in this part of the river. The water has no abnormal odor or color at this sampling station. Rowboats and canoes are much used for pleasure trips, especially upstream. Altogether, the water is that of a normal river, with a relatively small amount of contaminating material which produces no nuisance.

GIESBORO POINT.

The water here has received some polluting material and has had access to Fourmile Flat, comprising about 1,400 acres, this area being covered in summer with a dense growth of submerged plants.

The Anacostia River, or Eastern Branch of the Potomac, joins the river proper just above this sampling point. At ebb tide into this Eastern Branch empties the water of Washington Channel, an arti-

[1] *Kofoid.* Loc. cit.

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ficial waterway about 1 mile long and 200 yards wide, along which are the wharves and the shipping.

Some little sewage and a large amount of storm water empty into the Eastern Branch. In Washington Channel several large river steamers and a multitude of smaller craft will be sufficient guarantee for the entrance into the river of some waste material, including fecal matter. A number of fish markets and oyster wharves along this water front will in their season add to the contaminating material in the water of this channel.

The upper part of the 5-mile interval between Three Sisters and Giesboro Point receives the water of the Chesapeake & Ohio Canal, which is polluted by the addition of a considerable amount of sewage from Georgetown. A large storm-water sewer near the foot of Seventeenth Street, nearly a mile below the canal mouth, adds some polluting material after heavy rains or when streets have been scrubbed and flushed. In the lower 2 miles of the stretch on the Virginia side of the river and below the bridges is Fourmile Flat. A mile or more below Giesboro Point the sewage of Washington is pumped into midchannel. The upstream movement of tidewater, asisted sometimes by a stiff breeze, is likely to carry sewage-polluted water from the sewer outlet to the sampling station at Giesboro Point.

Plankton samples.—August collections were taken on the 18th and the 26th of the month, both at a depth of 8 feet ("vertical samples"). The water was nearly clear, with temperatures of 25° and 26°, respectively. Both samples were taken at low tide.

The sample of August 18 showed (per liter) 9,000 diatoms, including 3,000 *Synedra*. Other genera present were *Epithemia*, *Gomphonema*, *Navicula*, *Stauronesis*, and *Stephanodiscus*. Filaments of blue-green algæ, chiefly *Oscillatoria*, amounted to 36,000 standard units. *Raphidium*, a minute one-celled green algæ, numbered 3,000. Animal life consisted of 1,000 *Difflugia*, 3,000 *Codonella*, together with a few specimens of another unidentified infusorian. The rotifer *Anuraea cochlearis* numbered 1,000 and *Cyclops* (a crustacean) a similar number.

The August 26 sample showed a similar plankton. Five genera of Diatomaceæ were present, *Synedra* again in the lead with 7,000 per liter in a total of 12,000 diatoms. Blue-green algæ were represented by *Gleocapsa* (2,000 per l.) and a small amount of *Oscillatoria*. *Eudorina* (3,000) and *Scenedesmus* (1,000) of the green algæ were present. *Crenothrix* completed the list of plants. Animals present were: *Difflugia* (2,000) *Tintinnus*, an infusorian, (1,000), and *Codonella* (2,000). Rotifers: *Anuraea cochlearis* (1,000) and *Asplanchna* (1,000) completed the list.

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In September samples were taken on the 9th and the 18th. The tide was low or ebbing, and the water was nearly clear in each case. Diatoms were not numerous in either samples—6,500 per liter in the first and 4,000 in the second. However, the September 9 sample contained six genera, *Cocconema*, with 1,100 being in the lead. The second sample contained five genera, *Synedra* being by far the most abundant.

Filaments of *Oscillatoria* persisted in both samples. Another blue-green alga, *Clathrocystis*, appeared in the September 9 sample to the amount of 11,250 standard units per liter. In this same sample the minute green algæ *Eudorina* (750), *Scenedesmus* (1,500), *Protococcus* (5,625), *Polyedrium* (4,870), and *Staurastrum* (750) aggregated 13,500 per liter. These organisms were not found in the September 18 sample. *Crenothrix* was present in small amount in the first sample, and mold hyphæ in the second. Mastigophora (*Trachelomonas* and *Euglena viridis*) numbered 3,400 per liter in the first sample, but were absent in the second. Infusoria present in the first sample were *Codonella* (1,125), *Vorticella* (750), and *Halteria* (1,500); but only *Codonella* (1,000 per liter) appeared in the second sample. The rotifers *Colurus* (750), *Anuraea* (375), *Asplanchna* (300), *Brachionus* (1,900), and *Triarthra* (1,200), were in the first sample in the numbers (per liter) indicated. *Colurus* (250), *Anuraea* (770), and *Diglena* (240) were found in the second. A few crustaceæ (*Cyclops*) appeared in each sample, a few specimens of *Bosmina* were also found in the second. Nematode worms were in both samples, but they were not abundant.

The biological conditions just stated show evidence that the water is contaminated to some degree. The *persistence* of the blue-green algæ, together with their amount, indicates the admixture of a water that is distinctly more polluted than is the water at Three Sisters. This evidence is strengthened by the presence of *Trachelomonas* and *Euglena viridis* in one sample in moderate numbers, as both of these organisms, the latter especially, are characteristic of contaminated water. Consistent with these findings is the presence, in three of the four samples, of certain infusoria (*Tintinnus*, *Vorticella*, and *Halteria*) which normally live in water containing much organic matter. Finally, the number and variety of Rotifera (one sample yielding five genera) would seem to indicate the presence of their food supply, which consists largely of *Euglena*, ciliata, and microscopic algæ. (Kofoid, 1908.) These organisms are, in turn, dependent largely on a water rich in organic material. Several eminent investigators[1] are

[1] Drown, Jour. New England Waterworks Assn., 1888–90; Kofoid, Bull. Illinois Laboratory Nat. Hist., Vol. VIII, 1908, p. 24; Marsson, translation of lecture in Engineering News, Aug. 31, 1911.

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of the opinion that certain algæ may absorb as food a portion of the organic matter directly from the water and that such organic matter in water greatly encourages the growth of these organisms. If this be true, the presence of five genera of the simple microscopic algæ in the sample taken September 9 would seem reasonable evidence of the presence of a considerable amount of organic matter in the water.

November plankton showed 9,000 diatoms per liter, of which 4,200 were *Melosira* and 1,800 were *Surirella*. Other genera present were *Pleurosigma*, *Navicula*, and *Synedra*. A small amount of the green alga *Desmidium* was found, and a few filaments of *Crenothrix*.

About 600 *Cyclops*, mostly young, were present. No Flagellates, Ciliates, or Rotifers were found.

A sample collected January 15, 1914, contained 26,000 diatoms per liter, composed of *Synedra lanceolata* (10,000), *Synedra biceps* (5,600), *Navicula* (2,800) *Surirella* and *Gomphonema* (about 1,200 of each). A small amount of the blue-green *Oscillatoria* was present. Green algae were represented by Closterium (1,200) and a fragment of *Chætophora elegans*. A small amount of mold hyphae, the infusorian *Codonella* (400) and a few specimens of *Anguillula*, a minute worm, completed the list.

Samples collected March 31, April 11, and May 14 (1914), were noted chiefly for the large number of diatoms. The March sample contained about 10,000 each of *Synedra*, *Melosira*, and *Synedra biceps*, 4,000 *Navicula* and a similar number of *Meridion circulare*. A few specimens of Stephanodiscus were present. The April sample contained *Synedra* (25,000), *Asterionella* (81,000), *Navicula* (9,000), *Synedra biceps* (5,000), and a few *Cocconema*. The sample taken in May yielded (per liter) 8,000 *Synedra*, 10,000 *Melosira*, and a few of other genera, including *Nitzschia longissima*. No blue-green algea were found in any of the samples. *Crenothrix* appeared in the April sample. A few rotifers (*Anuraea*) were found in the May sample, and *Cyclops*, chiefly young, were in the March sample. All samples contained a few plant hairs, fragments of plant epidermis, bits of hair (from animals), and of vegetable tissue.

The plankton content of these five samples taken in November, January, March, April, and May, respectively, indicate only moderately clean water. In connection with this statement it should be noted, however, that the temperature in November (11°) January (0°) March (10.5°) and April (10°) would check bacterial action to a great extent, hence would deplete or remove the main food supply of certain bacteria-eating Infusoria and Rhizopods, whose presence is regarded as an indication of unclean water. This, however, would not apply to the sample taken in May, as the temperature of this sample was 19.5°.

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Bottom samples.—Mud samples scooped from the bottom of the channel of river in May consisted of mingled mud and sand. There was practically no odor, or a very slight one. In a plate of about 200 c. c. of mud there were found 19 tubificid worms, *Limnodrilus*, 2 young mussels, and 1 snail (*Planorbis*). Another sample, taken two weeks later, contained 71 worms and 2 *Chironomus* larvae. No living plants were found, the depth of the water here being about 30 feet.

FORT FOOTE.

This is 6 miles below Giesboro Point and 4½ miles below the point where Washington sewage is pumped into the river. Alexandria (15,000 population) is 2 miles above Fort Foote. This town has open sewers, and the sewage finds its way into the river, some of it draining in directly along the river front and some by a roundabout way through Hunting Creek Flat. The river is constricted at Fort Foote to the width of a half mile. Just above are two large expansions—Oxon Flat, with an area of about 1½ square miles, and Hunting Creek Flat, having an area of 1⅓ square miles. The water at Fort Foote is accordingly affected by the sewage of Washington and Alexandria, and by the two large flats, the tides insuring a mixing of all, water from flats, sewage, and channel water. While the sewage contamination is comparatively recent, as to distance, in point of time it may or may not be recent. At a certain stage of ebb tide and during certain months a water sample taken at Fort Foote will contain comparatively fresh sewage, having come, with little interruption by tides, direct from the place of discharge 4½ miles above. However, the same sample will contain the drainage of the flats, water and sewage which a previous flood tide has spread out on them, and which has been subject to such sedimentation, aeration, and general readjustment and biological action as the flats afford at that particular season. Again, a sample taken during flood tide will contain little or none of the sewage direct from the outlet above. Manifestly, the time of collecting (as to tides) will affect the chemical and particularly the biological content of the sample, the latter being very largely a question of the food supply found in organic matter of the water, together with the requisite time necessary for the breeding of those microscopic organisms collectively termed the plankton.

Samples were taken at this station usually in mid-channel every month, except January and February, from August to May, 1914. As many as four samples were taken during some months.

Environmental factors affecting aquatic life at this point are, in brief, the following:

1. Sewage from Washington pumped into the river 4½ miles above.
2. Tides, checking the current, reversing the flow, and mixing the waters.

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3. Flats comprising an area of 2¾ square miles between this station and the sewer.

4. Spreading of sewage-rich water on these flats by flood tide, and return of water to river channel at ebb tide.

5. Submerged plant life on the flats during the summer and consequent physical, chemical, and biological effects on the water.

6. The "time factor" accruing to the water and its organisms because of the tides, the flats, and the plants on the flats.

The time factor.—It should be noted that, on account of the tides, the sewage may not flow directly down river from the sewer outlet. A float, placed in the water at the sewer during high tide passed and repassed this point five times. As it slowly made its intermittent progress downstream, it was turned back temporarily by each flood tide, or was carried to the edge of the flat as the flood-tide water sought the path of least resistance by spreading out on the flat. Many hours elapsed before the float reached this sampling station at Fort Foote, only 4½ miles from its starting point. Had the float been able to follow the entire course of the water, as it spread out on the shallow flat and crept through the maze of aquatic plants, it would probably have been many days, instead of hours, in reaching Fort Foote.

The large time factor thus introduced and the thorough mixing of the sewage with a very large body of well-oxygenated water on the flats constitute the chief agencies affecting the water at this point. These conditions are reflected to some extent in the plankton content of the water.

If distance alone were considered, a large number of sewage organisms might be expected in the water only 4½ miles below the sewer. Such, however, is not the case. It remains to be seen whether or not this unexpected condition is a result of the time factor introduced by the tides, increased by the flats, and emphasized, extended, and enforced by the submerged vegetation.

To the organisms normally in the water the greatly lengthened time factor means opportunity for activity. This activity is along two lines—(1) the securing of food; (2) reproduction. Quiescent water affords suitable conditions for reproduction. The ensuing activity consists chiefly of "eating or being eaten." The smaller forms, consuming minute algæ or perhaps bacteria, are themselves consumed by the larger animal forms, whose size compensates for the great number of their victims. It is, indeed, a "struggle for existence." The "fittest," usually the largest and strongest, survive, possibly to be eaten by young fish, whose food consists largely of these organisms. Some of these fish, surviving the cannibalistic habits of their fellows, may reach maturity and become food for man. Thus with endless variations and many interruptions the transfer of organic matter goes on in the water, forming a food cycle, or a "chain

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of food relations," as aptly termed by Kofoid,[1] the various organisms concerned forming the links of the chain. It is the aquatic version of the food cycle, so familiar to all, wherein the land plant, nourished by inorganic food materials, becomes the food supply of worms or insects. These are devoured by birds or fowls, which in turn are eaten by larger animals, including man.

Plankton samples.—These were taken in midchannel every month from August to May, inclusive, except January and February, 1914. Twenty-four samples were taken in all. Because of the various factors affecting the water at this point, a relatively large number of samples were taken in order to secure a true picture of the average condition of the water.

August collections showed the following per liter: Diatoms 34,000, chiefly *Synedra* and *Navicula;* filaments of Oscillatoria 20,000 standard units, a small amount of *Spirogyra*, and 2,000 *Eudorina* appeared in one sample. *Raphidium* (2,500), *Scenedesmus* (1,000) and *Staurastrum* (1,000) completed the green algæ, except 21,000 standard units of the green alga *Ulothrix*, which was found in one sample. Both samples contained the Rhizopod *Difflugia*, 1,000, and 2,000 per liter, respectively, and one sample showed 5,000 standard units of mold hyphæ. Mastigophora were represented in one sample by 1,000 *Euglena*, and in the other by a similar number of *Phacus*. Of the Infusoria, there were 3,000 *Corchesium* per liter, and 7,000 *Codonella* in one sample and 3,000 in the other. Rotifers were present in both. *Anuraea cochlearis* (1,000 in each) and *Rotifer vulgaris* (1,000) in one. The crustaceans, *Bosmina* and *Cyclops*, about 1,000 each, appeared in one sample. *Cyclops* alone were found in the others. The majority of the cyclops were young. A few specimens of the minute worm *Anguillula* were present in one sample.

The presence of sewage in the water is indicated by the Molds, Rhizopods, Mastigophora, and Infusoria, especially the latter two. *Rotifer tardus* exhibits a decided preference for contaminated water. While these organisms are not present in large numbers, their moderate abundance, together with the variety of forms represented, bear reasonable testimony that sewage is not absent.

September collections showed essentially the same conditions. *Carchesium*, *Euglena*, and *Rotifer tardus* were not found, but *Phacus* and *Trachelomonas*, of the Mastigophora, and *Tintinnus* and *Epistylis*, of the Infusoria, furnished reasonable evidence of contamination.

In October samples the presence of "contaminate" organisms was less noticeable, and the evidence of pollution so far as plankton or-

[1] Bull. Illinois State Laboratory Nat. Hist., Vol. VI, Art. II, p. 535.

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ganisms were concerned, was at best doubtful. Certain forms, notably the Mastigophora and the Rotifera, decreased in abundance with the gradual advent of cool weather in October and November. Winter conditions, including much ice on the river, persisted until late in the spring, and probably had much to do with the delay of bacterial action in the water, the temperature of which was 9.5° as late as April 11, 1914. It is supposed (though as yet unproven) that the bacteria engaged in the destruction of organic material constitute the principal food supply of the Mastigophora and Infusoria, hence cold weather would tend to cut off this food supply by checking bacterial activity.

A sample taken May 4 shows the presence of *Trachelomonas* (Mastigophora) and Colpidium (an Infusorian). The latter organism, especially, is characteristic of impure water. Temperature of the water at this time was 18°. Subsequent samples taken in this month contained Mastigophora, Infusoria, Rotifera, and Crustacea, consistently increasing in number and variety until our last sample, taken May 25, when the temperature was 23°.

Bottom samples.—Mud samples, obtained in May from mid-channel at a depth of 35 feet, contained considerable vegetable débris, leaf fragments, etc., were very dark in color, and had a trace of sewage odor. No plants except a small amount of *Oscillatoria* were found in the mud.

The animal population was distinctly indicative of contaminated or polluted water. An average of 79 Tubificidae or "sewage worms" per plate (200 c. c. of mud) with a few *Chironomus* larvæ and young mussels (the latter in two samples only) were found. No may-fly larvæ, leeches, or unios (mussels) were seen, although these forms were fairly abundant in the adjacent flat.

Mud samples taken 500 feet below the sewer, together with the samples taken from the river channel 2 miles above Fort Foote, show counts consistent with those already mentioned.

Tubificid worms are very numerous just below the sewer, there being 1,000 or more per plate. Two miles above Fort Foote and 2½ miles below the sewer the number decreased to about 620, of which a part were possibly due to Alexandria sewage.

Reference to Table 27 will show that these curious organisms decrease consistently in number down the river, as the distance from the sewer increases. There is corresponding improvement in the odor of the mud also. It is probable that this worm is, in itself, a valuable index of the condition of the water.

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TABLE 27.—*Decrease of tubificid worms in mud from channel below sewage outlet.*

Location.	Distance below sewer.	Average number of tubificid worms in 200 c. c. mud.	Character of mud.		
			Color.	Odor.	Consistency.
Near sewer.....feet..	500	(1)	Very dark.	Foul, like sewage.	Soft; a little sand.
Opposite Alexandria.....miles..	2½	620	Dark.....	Strong, unpleasant.	Granular; some sand.
Fort Foote.....do....	4½	79	...do.....	Some odor of sewage.	Soft to heavy silt; granular clay.
Fort Washington.....do....	12	37	Dark to yellow.	Slight unpleasant odor.	Sticky to granular.
Whitestone Point.....do....	14	14	...do.....	Very slight	Granular, clay.
Indianhead.....do....	20	8	Yellow....	Slight.....	Granular, sandy.
Possum Point.....do....	26	2	Yellow to dark.	...do.....	Soft, clay, granular.
Maryland Point.....do....	40	(2)	...do.....	...do.....	Soft, granular.
Popes Creek.....do....	51	1	Yellow....	None.....	Soft, clay.
Lower Cedar Point.....do....	55	1	...do.....	...do.....	Fine, soft, granular.
Colonial Beach.....do....	62	0	Yellow to dark.	...do.....	Soft, clay.
Giesboro Point (above sewer).....	.....	19	Yellow to gray.	Slight.....	Sandy.
Anacostia River, or Eastern Branch (above sewer).	.....	6	Dark.....	Sewage odor.	Fine, sticky, soft.
Foot of Seventeenth Street (above sewer).	.....	2	.....	.....	
Below storm-water sewer, near Seventeenth Street (above sewer).	.....	20	.....	.....	

[1] Very numerous; over 1,000.

[2] In 1 sample.

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TABLE 28.—*Plankton data, Potomac River.*

THREE SISTERS STATION.

Number of sample.	Date.	Hour.	Surface.	Temperature of water (centigrade).	Turbidity.	Depth of water (feet).	Depth of sample (vertical section) (feet).	Tide.		Amount of sample (liters).	Amount of catch (c. c.).	Percentage of plankton.	Volume of plankton per m³ of water (c. c.).	Volume of amorphous matter and silt per m³ water (c. c.).	Total catch per m³ of water (c. c.).	Remarks.
								Ebb.	Flood.							
	1913.															
3	July 31	12.45 m....	Smooth.....	28	12	25	8	.....	Flood.	4	0.05	.....	.....	.....	.....	
10	Aug. 9	12.45 m....	Ripples.....	27	15	25	8	.....	...do...	4	.06	2.34	0.36	14.64	15.00	Dark clouds following shower.
14	Aug. 12	12.45 m....	.....do.....	26	40	25	8	Ebb...	.....	4	.07	.....	.....	.....	.....	Dark clouds.
23	Aug. 18	1.20 p. m..	.....do.....	26.5	28	25	8	...do...	.....	4	.04	2.27	.23	9.77	10.00	Sunshine.
28	Aug. 20	.....	.....do.....	27	19	25	8	...do...	.....	4	.05	4.29	.54	11.96	12.50	Breeze; sunshine.
35	Aug. 26	12.45 m....	Smooth.....	26.5	19	25	8	Low...	.....	4	.05	2.81	.35	12.15	12.50	Sunshine.
43	Sept. 2	2 p. m.....	Ripples.....	26	70	25	8	Ebb...	.....	4	.05	.....	.....	.....	.....	Do.
51	Sept. 9	1.20 p. m..	.....do.....	26.5	17	25	8	.....	Half...	4	.05	10.3	1.29	11.21	12.50	Cloudless; light breeze.
60	Sept. 17	1.45 p. m..	.....do.....	21.5	10	25	8	.....	Low...	4	.07	1.89	.33	17.17	17.50	Dark overcast; light breeze.
71	Sept. 30	1.30 p. m..	Light swell.	21.5	28	25	8	.....	...do..	3½	.04	4.46	.55	11.76	12.31	Sunshine; hazy clouds.
84	Oct. 16	1 p. m	Swell.....	16	40	25	18	.....	...do..	2	.08	1.46	.58	39.42	40.00	Cloudless; breeze.
88	Oct. 21	12.15 p. m.	.....do.....	14	26	25	25	.....	High .	4	.09	1.76	.40	22.10	22.50	Overcast; breeze.
95	Nov. 4	2.20 p. m..	Swell and waves.	11	55	25	20	Ebb...	.....	3	.06	1.25	.33	26.34	26.67	Sunshine; breeze.
103	Nov. 18	1 p. m.....	Smooth.....	8	150	25	20	High..	.....	2	.25	2.05	2.56	122.44	125.00	Sunshine; water muddy; breeze.
109	Nov. 25	1 p. m.....	.....do.....	10	45	25	20	...do...	.....	4	.10	6.01	1.50	23.50	25.00	Overcast; plants floating.
	1914.															
146	Mar. 31	1.30 p. m..	Small waves	10.5	45	25	9	Half...	.....	2	.14	4.78	3.35	66.65	70.00	Partial overcast; breeze.
151	Apr. 13	2 p. m.....	.....do.....	.....	.....	.....	8	Low...	.....	4	.12	5.77	1.73	28.27	30.00	Cloudless; light breeze.
	Average.....												1.00			

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	1913.															
18	Aug. 13	12 m.....	Ripples.....	25.5	40	38	8	Low...	.....	4	0.07	5.45	.95	16.55	17.50	Dark clouds.
22	Aug. 18	12 m	.....do.....	26	.....	38	8	...do...	.....	4	.05	12.41	1.55	10.95	12.50	Sunshine; light swell.
34	Aug. 26	12 m.....	Small waves	25	11	38	8	.....	Low..	4	.10	5.79	1.45	23.55	25.00	Sunshine; breeze.
46	Sept. 3	1.15.....	.....do.....	26	22	38	8	.....	.....	4	.08	.....	.....	.....	.....	Partial overcast.
48	Sept. 9	9 a. m.....	.....do.....	26	15	38	8	.....	Low..	4	.09	6.28	1.40	21.10	22.50	Cloudless; light breeze.
64	Sept. 18	1 p. m.....	Waves and swell.	22	10	38	8	Ebb ..	.....	4	.09	5.01	1.13	21.37	22.50	Overcast.
94	Oct. 4	1.30 p. m..	.....do.....	11	50	38	35	...do..	.....	2	.05	7.24	1.81	23.19	25.00	Sunshine; breeze.
	1914.															
133	Jar. 15	10.30 a. m.	Floating ice.	0	100	38	35	.....	.....	3	.08	5.13	1.37	25.29	26.66	Overcast; calm; cold.
135	Jan. 22	10 a. m....	Thin ice.....	1	50	38	37	Ebb ..	.....	4	.11	2.19	.60	26.90	27.50	Partial overcast.
141	Mar. 16	1 p. m.....	.....	5	80	38	25	High..	.....	.....	.04	.....	.....	.....	.....	
145	Mar. 31	1 p. m.....	Small waves	10.5	35	38	9	...do..	.....	2	.08	3.59	1.44	38.56	40.00	
150	Apr. 11	1.40 p. m..	Rough.....	.....	.....	38	8	.....	Low..	3	.10	3.46	1.15	32.18	33.33	
162	May 14	10.30 p. m.	Smooth.....	19.5	.....	38	7	.....	Half..	4	.12	2.63	.79	29.21	30.00	
		Average.....											1.24			

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TABLE 28.—*Plankton data, Potomac River*—Continued.

FORT FOOTE STATION.

Number of sample.	Date.	Hour.	Surface.	Temperature of water (centigrade).	Turbidity.	Depth of water (feet).	Depth of sample (vertical section) (feet).	Tide.		Amount of sample (liters).	Amount of catch (c. c.).	Percentage of plankton.	Volume of plankton per m³ of water (c. c.).	Volume of amorphous matter and silt per m³ water (c. c.).	Total catch per m³ of water (c. c.).	Remarks.
								Ebb.	Flood.							
	1913.															
13	Aug. 12	11 a. m.	.....	26	.....	45	8	Ebb	.....	4	0.10	9.37	2.34	22.66	25.00	Raining.
20	Aug. 18	10 a. m.	Ripples	26	17	45	8	...do	.....	4	.10	.....	.....	.....	.....	Dark overcast.
24	Aug. 19	9.45 a. m.	....do	26	18	45	8	...do	.....	4	.09	.....	.....	.....	.....	Sunshine.
32	Aug. 26	9.40 a. m.	Waves	25	13	45	8	.....	Low	4	.10	7.49	1.87	23.13	25.00	Sunshine and breeze.
40	Sept. 2	9.45 a. m.	Small waves	26	17	45	8	.....	High	4	.08	4.40	.88	19.12	20.00	Sunshine; staminate flowers of eel grass floating.
49	Sept. 9	9.40 a. m.	....do	26	11	45	8	Low	.....	4	.09	3.40	.77	21.73	22.50	Cloudless; light breeze.
62	Sept. 18	9.45 a. m.	Waves and swell.	21.5	18	.....	8	.....	High	4	.17	3.43	1.46	41.05	42.50	Dark overcast; light rain; breeze.
69	Sept. 30	9.30 a. m.	Light swell	20	26	45	8	.....	...do	4	.13	3.17	1.03	31.47	32.50	Cloudless; calm.
72	Oct. 7	9.45 a. m.	....do	19	45	45	35	Low	.....	4	.15	5.54	2.08	35.42	37.50	Dark overcast; calm.
73	...do	9.45 a. m.	....do	19	45	45	35	...do	.....	4	.18	3.80	1.71	43.29	45.00	Do.
81	Oct. 16	9.30 a. m.	Calm	17	20	45	35	.....	High	4	.11	7.79	2.14	25.36	27.50	Cloudless; vegetation floating.
87	Oct. 21	11 a. m.	Small waves	15	26	45	40	.....	...do	4	.09	6.71	1.51	20.99	22.50	Overcast; breeze.
92	Nov. 4	11 a. m.	Waves and swell.	11	80	45	35	.....	...do	2	.08	7.85	3.14	36.86	40.00	Sunshine; breeze.
101	Nov. 18	9.45 a. m.	Calm	7	120	45	40	.....	...do	4	.10	5.58	1.40	23.60	25.00	Do.
107	Nov. 25	9.45 a. m.	....do	10	90	45	35	Low	.....	4	.10	3.59	.90	24.10	25.00	Do.
113	Dec. 5	12.30 a. m.	Waves	10.5	35	45	40	.....	High	4	.17	2.09	.89	41.61	42.50	Do.
	1914.															
139	Mar. 16	10 a. m.	Calm	3.5	60	45	35	.....	.....	3	.04	8.35	1.11	12.22	13.33	Sunshine; calm.
143	Mar. 31	10 a. m.	Waves	10.5	30	45	40	.....	Half	3	.07	5.80	1.35	21.98	23.33	Partial overcast; breeze.
148	Apr. 11	10 a. m.	Rough	9.5	30	45	8	Half	.....	4	.06	5.91	.89	14.11	15.00	Light overcast; stiff breeze; "white caps."
153	May 4	3 p. m.	Smooth	18	24	.....	8	...do	.....	2	.10	1.57	.79	49.21	50.00	Sunshine; débris floating.
163	May 14	11 a. m.	Small waves	20	.....	45	8	.....	.....	4	.07	6.16	1.08	16.42	17.50	Sunshine; light breeze.
165	May 19	9.15 a. m.	Waves	20.5	.....	45	8	.....	Low	4	.15	2.40	.90	36.60	37.50	Do.
185	May 26	9.30 a. m.	.....	23	30	45	8	Half	.....	4	.10	4.12	1.03	23.97	25.00	
	Average												1.35			

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	1913.															
1	July 31	10.30 a. m.	Smooth.....	27	20	38	8	Half...	.....	4	0.18	9.75	4.43	40.57	45.00	Floating débris.
8	Aug. 9	9.45 a. m..	.....do.....	27.5	17	38	8	.....	Flood.	4	.11	5.30	1.46	26.04	27.50	Partial overcast.
12	Aug. 12	10 a. m....	Rain.....	26	17	38	8	Ebb..	.....	4	.18	8.89	4.00	41.00	45.00	Hard rain.
21	Aug. 18	10.30 a. m.	Ripples.....	26	20	38	8	...do...	.....	4	.10	.....	.....	.....	.....	Sunshine.
25	Aug. 19	10.30 a. m.	Waves.....	26	30	38	8	...do...	.....	4	.10	.....	.....	.....	.....	Do.
33	Aug. 26	9.40 a. m..	Small waves	25	17	38	8	.....	Low..	4	.10	5.43	1.36	23.64	25.00	Sunshine; breeze.
41	Sept. 2	10.45 a. m.	Ripples.....	27	28	38	8	.....	High..	4	.10	.....	.....	.....	.....	Sunshine.
50	Sept. 9	10.40 a. m.	Waves and swell.	26	22	38	8	Low ..	.....	4	.09	9.44	2.12	20.38	22.50	Clouds; stiff breeze.
63	Sept. 18	10.45 a. m.	.....do.....	22	40	38	8	High..	.....	4	.13	5.10	1.66	30.84	32.50	Overcast; light rain.
70	Sept. 30	10.30 a. m.	Swell.....	21	30	38	8	...do...	.....	4	.30	2.77	2.08	72.92	75.00	Cloudless; calm.
74	Oct. 7	11 a. m....	.....do.....	19	80	38	25	.....	Half..	3½	.25	5.30	4.08	72.92	77.00	Dark overcast; breeze.
75	...do....	11 a. m....	.....do.....	19	75	38	25	.....	...do...	4	.27	4.48	3.02	64.48	67.50	Do.
82	Oct. 16	10.30 a. m.	Small waves	18	28	38	24	.....	High..	3½	.28	3.08	2.46	77.54	80.00	Cloudless; breeze; floating vegetation.
93	Nov. 4	11.40 a. m.	.....do.....	12	140	38	25	.....	...do...	2	.07	6.92	2.42	32.58	35.00.	Sunshine; breeze.
102	Nov. 18	10.30 a. m.	.....do.....	7	100	38	30	.....	...do...	2	.10	2.16	1.08	48.92	50.00	Do.
108	Nov. 25	10.35 a. m.	.....do.....	10	110	38	20	Low ..	.....	4	.10	5.56	1.39	23.61	25.00	Do.
114	Dec. 5	1.30 p. m..	Waves and swell.	10	40	38	30	.....	High..	4	.09	2.42	.54	21.96	22.50	Do.
	1914.															
140	Mar. 16	11 a. m....	Smooth.....	3	60	38	35	.....	.....	4	.05	11.33	1.42	11.08	12.50	
144	Mar. 31	11 a. m....	Small waves	11	30	38	9	.....	High..	4	.06	9.28	1.39	13.61	15.00	Light breeze.
149	Apr. 11	11 a. m....	Rough.....	11.5	100	38	8	High..	.....	3	.18	1.90	1.14	58.86	60.00	Sunshine; stiff breeze; "white caps."
164	May 14	12.30 p. m.	Small waves	20	.....	38	8	Half ..	.....	4	.12	3.52	1.06	28.94	30.00	Sunshine; light breeze.
	Average.....												2.06			

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TABLE 28.—*Plankton data, Potomac River*—Continued.

DISTRICT I.—ESTUARY POTOMAC STATION.

Number of sample.	Date.	Hour.	Surface.	Temperature of water (centigrade).	Turbidity.	Depth of water (feet).	Depth of sample (vertical section) (feet).	Tide.		Amount of sample (liters).	Amount of catch (c. c.).	Percentage of plankton.	Volume of plankton per m³ of water (c. c.).	Volume of amorphous matter and silt per m³ water (c. c.).	Total catch per m³ of water (c. c.).	Remarks.
								Ebb.	Flood.							
	1913.															
117	Dec. 16	3 p. m.....	Small waves.	7	28	30	25	.....	Low..	4	0.10	4.81	1.20	23.80	25.00	Sunshine; breeze (Liverpool Point).
128	Dec. 18	12.30 p. m.	Waves and swell.	6.5	60	30	25	High..	.....	4	.10	13.77	3.44	21.56	25.00	Cloudless.
118	Dec. 16	4 p. m.....	Small waves.	7	18	50	40	Low..	.....	4	.25	5.13	3.21	59.29	62.50	Partial overcast (Maryland Point).
127	Dec. 18	11.30 a. m.	Rough.....	7	35	50	45	.....	High..	4	.18	9.70	4.37	40.63	45.00	Cloudless (Maryland Point).
	1914.															
155	May 7	3 p. m.....	.....	19	80	50	45	Low..	.....	2	.05	9.89	2.47	22.53	25.00	Do.
178	May 22	9.45 a. m..	Smooth.....	21.5	50	50	7	Half..	.....	2	.08	5.20	2.08	37.92	40.00	Sunshine; calm (Maryland Point).
	1913.															
119	Dec. 16	5.30 p. m..	Calm.....	8	24	48	45	Low..	.....	4	.43	3.17	3.41	104.09	107.50	Calm (Popes Creek).
126	Dec. 18	10.15 a. m.	Small waves.	8	15	48	45	.....	High..	4	.25	2.94	1.84	60.66	62.50	Cloudless; breeze (Popes Creek).
	1914.															
156	May 7	5 p. m.....	.....	18	25	48	8	.....	Half...	4	.05	24.17	3.02	9.48	12.50.	Sunshine (Popes Creek).
177	May 22	9 a. m.....	Smooth.....	20	12	48	8	Half...	.....	2	.05	13.53	3.38	21.62	25.00	Sunshine; calm (Popes Creek).
157	May 7	6 p. m.....	.....do.....	.....	.....	48	8	High..	.....	4	.08	4.22	.84	19.16	20.00	Sunshine; breeze (Lower Cedar).
	Average.....												2.66			

DISTRICT II.—ESTUARY POTOMAC STATION.

	1913.															
120	Dec. 17	9.45 a. m..	Calm.....	8	7	50	45	.....	High..	4	0.10	12.55	3.14	21.86	25.00	Sunshine; breeze (Blakistons Island).
	1914.															
129	Jan. 13	9.45 a. m..	Small waves.	2	40	50	30	.....	...do...	3	.16	8.73	4.66	48.67	53.33	Do.
169	May 19	6 p. m.....	Calm.....	21	9	50	8	.....	.....	4	.04	11.59	1.16	8.84	10.00	Sunshine; calm (Blakistons Island).
175	May 21	11.20 a. m.	.....do.....	22.5	8	30	8	.....	.....	4	.16	4.88	1.95	38.05	40.00	Cloudless; calm (St. Clements Bay).
174	.....do...	10 a. m.....	.....do.....	22.5	8	30	8	.....	.....	4	.09	14.72	3.31	19.19	22.50	Cloudless; calm (Bretons Bay).

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DISTRICT III.—ESTUARY POTOMAC STATION.

	1913.															
125	Dec. 17	3.30 p. m..	Calm.....	8	7	30	25	.....	Low..	4	0.18	14.51	6.53	38.47	45.00	Light overcast (Ragged Point).
122	...do	12 m.....	.....do.....	8	7	20	10	.....	High..	4	.09	26.8	6.03	16.47	22.50	Light overcast (St. Georges Island).
	1914.															
170	May 20	8.15 a. m..	Waves.....	19.5	8	28	8	.....	.....	4	.04	12.04	1.20	8.80	10.00	Sunshine; breeze (Priests Point).
131	Jan. 13	2 p. m.....	Small waves.	2	12	38	30	Half...	.....	3	.05	9.9	1.65	15.02	16.67	Sunshine; light breeze (St. Marys River).
130	Jan. 13	1.30 p. m..	.....do.....	2	12	20	15	...do...	.....	3	.07	10.43	2.43	20.90	23.33	Do.

DISTRICT IV.—ESTUARY POTOMAC STATION.

	1913.															
123	Dec. 17	1.30 p. m..	Calm.....	8.5	7	16	13	Half...	.....	4	0.09	52.83	11.89	10.61	22.50	Sunshine (Point Lookout).
124	...do	2.15 p. m..	.....do.....	8	7	35	30	...do...	.....	4	.15	20.62	7.73	29.77	37.50	Do.

Average for Districts II, III, and IV, 4.31 c. c. plankton per m^3 of water.

HUNTING CREEK FLAT, STATION F.

	1913.															
6	Aug. 6	10.45 a. m.	Smooth.....	28	8	5	4	.....	High..	4	0.10	.....	.....	.....	.....	Cloudy; eel grass abundant.
16	Aug. 13	10.45 a. m.	.....do.....	23	12	4	3	Half...	.....	4	.10	6.17	1.54	23.46	25.00	Dark overcast; eel grass abundant.
31	Aug. 21	10.45 a. m.	.....do.....	25	8	5	4	.....	High..	4	.10	25.34	6.34	18.66	25.00	Partial overcast; eel grass abundant.
37	Aug. 27	10.45 a. m.	.....do.....	25	7	3	2	Low..	.....	4	.08	.....	.....	.....	.....	Sunshine; eel grass abundant.
45	Sept. 3	11.30 a. m.	.....do.....	26	11	4	3	Half...	.....	4	.10	36.19	9.05	15.95	25.00	Sky overcast; breeze; eel grass abundant.
53	Sept. 10	11 a. m....	.....do.....	21	8	4	3	.....	Low..	4	.05	27.00	3.37	9.13	12.50	Sunshine; eel grass abundant.
58	Sept. 17	11 a. m....	.....do.....	21	6	5½	5	.....	High..	4	.09	.....	.....	.....	.....	Dark overcast; calm; eel grass abundant.
66	Sept. 24	11 a. m....	.....do.....	18	7	4	3	Half...	.....	4	.04	32.20	3.23	6.77	10.00	Sunshine; calm; eel grass abundant.
78	Oct. 8	11 a. m....	.....do.....	19.5	9	5	4	.....	Half...	4	.08	6.51	1.30	18.70	20.00	Dark overcast; calm; eel grass abundant.
79	Oct. 15	11 a. m....	.....do.....	18	12	4	3	.....	...do...	4	.05	11.17	1.40	11.10	12.50	Light overcast; calm; eel grass abundant.
184	May 26	4 p. m.....	.....do.....	28	30	2½	1½	Low..	.....	2	.10	3.04	1.52	48.48	50.00	Sunshine; potamogeton abundant.
		Average.....											3.46			

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TABLE 28.—*Plankton data, Potomac River*—Continued.

HUNTING CREEK FLAT, STATION G.

Number of sample.	Date.	Hour.	Surface.	Temperature of water (centigrade).	Turbidity.	Depth of water (feet).	Depth of sample (vertical section) (feet).	Tide.		Amount of sample (liters).	Amount of catch (c. c.).	Percentage of plankton.	Volume of plankton per m³ of water (c. c.).	Volume of amorphous matter and silt per m³ water (c. c.).	Total catch per m³ of water (c. c.).	Remarks.
								Ebb.	Flood.							
	1913.															
5	Aug. 6	10.30 a. m.	Smooth.....	27	9	8	7	.....	High..	3	0.05	46.86	7.81	8.86	16.67	Cloudy; much eel grass, etc., present.
15	Aug. 13	10.30 a. m.	.....do.....	24	7	8	6	Half...	.....	4	.05	.....	.....	.....	.....	Dark overcast; much eel grass, etc., present.
30	Aug. 21	10.30 a. m.	.....do.....	25	9	8	7	.....	Half...	4	.08	17.80	3.56	16.44	20.00	Sunshine; much eel grass, etc., present.
36	Aug. 27	10.30 a. m.	.....do.....	25	7	6	4	Low..	.....	4	.11	.....	.....	.....	.....	Light overcast; much eel grass, etc., present.
54	Sept. 10	11 a. m.	.....do.....	23	8	6	5	.....	Low..	4	.09	21.58	4.86	17.64	22.50	Do.
57	Sept. 17	11 a. m.	.....do.....	21	6	6	6	.....	High..	4	.10	16.71	4.18	20.82	25.00	Dark overcast; calm; much eel grass, etc., present.
65	Sept. 24	10 a. m.	.....do.....	19	7	6	4	.....	Low..	4	.....	.....	.....	.....	.....	Sunshine; much eel grass, etc., present.
77	Oct. 8	11 a. m.	.....do.....	19.5	12	6	4	Low..	.....	4	.08	10.82	2.16	17.84	20.00	Partial overcast; much eel grass, etc., present.
97	Nov. 5	4 p. m.	.....do.....	11	20	6	4	...do...	.....	2	.08	13.11	5.24	34.76	40.00	Sunshine; much eel grass, etc., present.
111	Nov. 26	11 a. m.	.....do.....	8	35	6	3	...do...	.....	4	.10	11.00	2.75	22.25	25.00	Dark overcast; spirogyra present.
183	May 26	3 p. m.	.....do.....	25	35	6	3	...do...	.....	2	.08	7.34	2.94	37.06	40.00	Sunshine; very few plants.
	Average.....												4.19			

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HUNTING CREEK FLAT, STATION M.

	1913.															
90	Oct. 22	5 p. m.	Smooth	13	12	5	4	Ebb		2	0.05	32.72	8.18	16.82	25.00	Sunshine; calm; eel grass, etc.
91	Oct. 29	10 a. m.	do	14.5	15	5	4	do		4	.09	11.82	2.66	19.84	22.50	Sunshine; most of flat very muddy.
96	Nov. 5	3 p. m.	do	11	24	5	4	do		2	.05	7.25	1.81	23.19	25.00	Sunshine; spirogyra on eel grass.
99	Nov. 12	10 a. m.	do	6	28	5	4	do		4	.07	6.87	1.20	16.30	17.50	Do.
110	Nov. 26	10 a. m.	do	9	40	5	4	do		2	.07	4.67	1.63	33.37	35.00	Overcast; calm; spirogyra on eel grass.
132	May 26	3 p. m.	do	25	35	5	4	do		2	.08	8.63	3.45	36.55	40.00	Sunshine; plants starting to grow.
		Average											3.15			

ANACOSTIA RIVER, OR EASTERN BRANCH, STATION.

	1913.															
11	Aug. 12	9 a. m.	Rain	27		25+	8	Ebb		4	0.08	6.24	1.25	18.75	20.00	Rain.
19	Aug. 18	9 a. m.	Quiet	25	17	25+	8	do		4	.06	11.68	1.75	13.25	15.00	Dark overcast after shower.
39	Sept. 2	9 a. m.	do	26	20	25+	8		High	4	.10	5.78	1.45	23.55	25.00	Sunshine.
61	Sept. 18	9 a. m.	Small waves	22	12	25+	8		do	4	.09	10.34	2.33	20.17	22.50	Diffused sunlight.
68	Sept. 30	9 a. m.	Calm	20	40	25+	8		do	4	.09					Diffused sunlight; vegetation floating.
80	Oct. 16	9 a. m.	do	17	22	25+	24		do	4	.10	2.33	.58	24.42	25.00	Cloudless; calm; vegetation floating.
98	Nov. 11	9 a. m.	Small waves	8	40	25+	18		do	4	.15	10.00	3.75	33.75	37.50	Half overcast; light breeze.
100	Nov. 18	9 a. m.	do	7	100	25+	25		do	3½	.12					Sunshine; floating débris.
106	Nov. 25	9 a. m.	do	10	45	25+	22	Low		4	.06	2.36	.35	14.65	15.00	Sunshine; slight breeze.
138	Mar. 16	9 a. m.	Quiet	4	70	25+	25			4	.09	7.65	1.72	20.78	22.50	Sunshine; calm.
142	Mar. 13	9 a. m.	Small waves	10.5	30	25+	9		Half	4	.08	2.54	.51	19.49	20.00	Partial overcast; breeze.
147	Apr. 11	9 a. m.	Rough	9	35	25+	8	Half		4	.06	6.35	.95	14.05	15.00	Partial overcast; stiff breeze.
		Average											1.46			

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MOUNT VERNON AND MARSHALL HALL.

This station is 12 miles below the sewer outlet. In point of time, however, it is an average of about 4 days' distant, as shown by float experiments. The sewage and water below the mouth of sewer have been subject during this 4-day interval to the physical, chemical, and biological action incident to 16 tides; 8 flood tides have checked the current or turned it upstream and spread much of the channel water out on the flats; and 8 ebb tides have again reclaimed a portion of the water by partial drainage of the flats and shallows.

Between Mount Vernon and Fort Foote above are two large flats, together with a considerable area of marginal flats along the river channel. The approximate total area of flats to which the water is exposed in the 100-hour trip from sewer to Marshall Hall is 6.7 square miles,[1] or over 4,200 acres. This is exclusive of the channel proper.

Occasional samples, taken at Whitestone Point just below Marshall Hall, and at Indianhead, 6 miles below, represent similar conditions and will be included with the Marshall Hall samples.

Plankton samples.—Collections at this station give results so nearly like those of Fort Foote, 8 miles above, that a brief mention will be sufficient.

A considerable increase in the average number of diatoms over those at Fort Foote, together with a further decrease of those organisms which indicate contamination, seem to constitute the chief points of difference.

Two large flats are located between Fort Foote and Marshall Hall. Irrespective of these flats the average width of the river here is about 1 mile. We find here the same factors essentially as those that obtained at Fort Foote, with a substantial balance, however, in favor of better water because—(1) two additional flats serve as delay stations and oxygenating bases; (2) the time factor is increased to four days, not including the probable delay of several days on the flats where the float could not follow; and (3) the volume of water is greatly increased, hence there is greater dilution.

These changes in environment are consistently reflected in the improvement in the plankton content. Diatoms are abundant. Blue-greens are present in only 3 of the 15 samples. Mold hyphæ appear in two samples, Rhizopoda in four, and Mastigophora in two. The Infusoria (exclusive of the ever-present *Codonella* which, according to Kofoid, does not necessarily indicate the presence of polluting material), are present in four samples only.

Rotifer actinurus, a lover of contaminated water, appears in two samples, but other genera appear in eight samples.

[1] Approximated by writer from navigation chart of Potomac River.

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Crustacea, chiefly *Cyclops*, appear in 10 samples, but in small numbers. This organism is a normal inhabitant of water of good quality as far as sewage is concerned. On the whole, the evidence furnished by the plankton as to the presence of sewage is almost negative.

Mud samples from this point, or a little below at Whitestone Point, show an average number of 12 tubificid worms in the same amount of mud that yielded 79 worms at Fort Foote. *Chironomus* larvæ were found (one specimen) in each of two samples. One sample showed a small amount of blue-green algæ. The mud had no offensive odor. It contained some small plant fragments, chiefly of forest leaves. According to this evidence of the mud, pollution is not absent, though present evidently in small amount only.

The plankton samples showed *Synedra* to be the most abundant in eight of the collections. The other leading genera were *Navicula*, *Cyclotella*, *Pleurosigma*, *Surirella*, and *Stephanodiscus*. *Gomphonema* was found in two samples, and *Nitzschia* appeared in one sample only. Various other genera appeared in some of the samples, but in small amounts only. In the sample of October 7 there were 12 genera represented in the total diatom count of 45,000.

STUDY OF THE FLATS.

Samples were taken on representative flats to secure data (1) as to plankton content and mud organisms, (2) as to dissolved gases, and (3) to determine what benefit or injury, if any, resulted to the water from the growth, activity, and decay of submerged plants. Incidental but important factors were (1) results of tidal action, (2) fate of sewage entering a plant-filled flat, (3) high turbidity caused by winds in absence of submerged plants, and (4) effects of sunlight on plant activity.

OXON FLAT.

Area, about 1½ square miles. Located opposite Alexandria, and 2½ miles below outlet of Washington sewer. This was intended to be a regular sampling point, but the activity of large dredges in the immediate vicinity necessitated abandoning this station in October.

HUNTING CREEK FLAT.

This flat was studied with care. It comprises an area of 1.3 square miles, with a river frontage of 1.25 miles extending from Jones Point Light, below Alexandria, to Smiths Point, opposite Fort Foote. The shores are only partially cleared, some brush and small trees covering the banks farthest from the river. A marsh of about 0.18 square mile in extent constitutes the extreme upper portion farthest from

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the river. This marsh is thickly covered with various swamp plants, chiefly *Alisma* (water plantain), *Sagittarius* ("Arrow-head") various sedges, and great quantities of *Zizania aquatica* (wild rice or water oats), and other water grasses. The luxuriance of this marsh growth is easily understood when we consider the fertility of the swamp mud and the action of the tides by which the growing crop is alternately covered with water and exposed to air every six hours.

A country road bridges the extreme upper part of this flat, bordering the marsh just mentioned. About one-third mile farther toward the river a long bridge, supported on trestles and belonging to the Mount Vernon, Alexandria & Washington Electric Railway, is constructed across the flat. The water at this point is 3 to 6 feet deep at mean low tide. Approximately the same depths prevail over the entire flat from this bridge to the river channel. Three small runs empty into the upper part of the flat, two being polluted with sewage from Alexandria and smaller near-by towns. The mouths of these sewage-laden runs are marked P and R, respectively (see map No. 8). The one marked R discharges approximately 2½ to 3 cubic feet per second, while the other discharges about 4 to 5 cubic feet. The discharge from R varies considerably with the time of day and the day of week, being greatest in the mornings and especially on Monday (wash day). The water discharged has a foul odor, is grayish in color, and contains abundant evidence of its source in the shape of floating bits of toilet paper, masses of *Leptomitus*, a fungus usually found in sewage, and black, foul sludges in the bottom, from which much gas arises when it is disturbed.

The water in P is polluted to a less extent when it reaches the flat. This run contains sewage from one or two small suburban towns. Occasional floating masses of *Leptomitus*, together with certain blue-green algæ (especially *Oscillatoria*) and a green alga, *Coleochæte*, attest that its water is less polluted than that of R. The bottom mud of this larger run contains in certain quiet, shallow places great numbers of tubificid worms.

A small dredged channel ("Keystone") extends from the river proper into this flat a distance of a half mile or more. This channel, 30 feet wide at the mouth and 8 or 10 feet deep, drains that part of the flat nearest Alexandria. The lower part of the flat is drained by a broad, natural "swash channel," about 500 feet wide and 5 feet deep. The middle part of the flat contains, next to the river channel, a "bar" of mud, which has barely a foot of water over it at low tide. Practically the entire flat is covered with a luxurious growth of submerged plants, chiefly *Vallisneria spiralis*, or eelgrass; *Ceratophyllum* (horn wort); various *Potamogetons*, especially *Potamogeton crispus;* and a few other plants. At intervals during the year there

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is a heavy growth of the green algæ, *Oedogonium*, and in later summer the tips of the larger plants support a considerable growth of *Spirogyra*. Other algæ, including *Hydrodictyon*, are present at times in considerable abundance. The variety and abundance of these plants is surprising, and needs to be seen to be appreciated. At low tide the flat looks not unlike a great meadow, level as a floor. At such times rowboats and other small craft can with difficulty penetrate the mass.

Samples were collected at four points, representing as nearly as possible the principal "biological situations" to be found here. The point designated by the letter F, near the mouth of an open sewer (R), represents "contaminated" conditions. Point G is in mid-flat, about one-third of a mile from this sewer, and about halfway to the main river channel. This was chosen to represent conditions typical of the flat, and of any other similar flats as well. The other points were selected especially for study of the gas content of water as it returned from the flat to the river channel. Point K is the lower part or mouth of Keystone Channel, which, during ebb tide, drains the up-river part of the flat. Point M, or Smiths Point, is nearly a mile farther down, but still on the riverward portion of the flat in the broad swash channel that drains the larger portion of the flat at ebb tide. Reference to map No. 9 will show the relative locations of these points.

Plankton samples were taken at points F, G, and M. Bacteriological samples and samples to ascertain CO_2 (free) and dissolved oxygen were taken at points K, F, G, and M, and samples of bottom mud for macroscopic examination at F, G, and M. No samples were taken here during the winter, as the flat was covered with ice and the sampling points were inaccessible.

Point F.—Plankton samples were collected during low tide within 200 yards of the small sewer run marked R in map No. 8. At high tide the sample was taken within 50 yards of the sewer mouth. This shifting of the point of collection was for the purpose of compensating to some extent for the large amount of dilution water into which the sewer emptied at high tide.

The water at this point is 1½ to 2 feet deep at low tide, this depth being increased by about 30 inches at high tide. The water has no appreciable odor and only a slight discoloration, which seems to be due to the sewage entering near this point, although a perceptible odor is occasionally wafted to this collecting point from the near-by sewer itself.

During summer and autumn submerged plants cover this portion of the flat. *Potamogeton crispus*, *Ceratophyllum*, and *Vallisneria spiralis*, with considerable quantities of the alga *Hydrodictyon*, are

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the most abundant. Various other plants are present in small quantities from time to time.

Plankton samples collected in August show diatoms, green algæ (*Desmideæ* and a small amount of filamentous algæ), and Crustacea (Cyclops) of the cleaner water organisms. Contaminate organisms present are *Oscillatoria*, mold hyphæ, *Carchesium*, and certain rotifers. An unidentified Nematode, also an animal resembling *Euglena*, unidentified in the preserved material, are present also and persist in several other samples collected at this point.

Careful observation at several points along the open sewer showed typical conditions. Portions of the bottom were covered with tufts of *Leptomitus*. Small masses torn loose from time to time floated with the current. The water had a grayish or milky appearance at times, and bits of toilet paper, burnt matches, etc., were abundant. The edges of the stream were foul with accumulated waste, and gases bubbling from the bottom sludges produced a typical sewage odor. This stream was from 5 to 7 feet wide and shallow, under normal conditions having an average depth of about 8 inches. The rate of flow was approximately one-half foot per second.

September samples from station F tell essentially the same story. The contamination of the water by sewage is indicated by the persistence of those organisms of the plankton that are normally found in unclean water. The list in the September samples includes a few blue greens, four genera of the Rhizopoda, *Chilomonas*, of the Mastigophora (in one sample only), and *Epistylis* of the Infusoria, the latter genus in one sample only. The organism resembling Euglena appeared in all samples and the unidentified Nematode was found in one sample.

Rotifers appeared in all samples, and the presence of moderate numbers of *Cyclops*, *Chydorus*, and *Bosmina*, of the Crustacea, seemed to testify that the water was not wholly bad even at this point, though most of the samples were taken at low tide. One sample was taken at extreme high tide and contained only one pollutional organism, *Oscillatoria*.

October samples contained a trace only of *Oscillatoria* of the blue-greens, and only Conferva and *Desmidium* of the green algæ; whereas September samples had yielded 10 genera, including *Closterium* and *Cosmarium* in three samples; *Coelastrum*, *Staurastrum*, *Protococcus*, *Raphidium*, and *Tetraspora* in one sample; *Scenedesmus* in three samples; *Eudorina* in two; and *Hydrodictyon* in three. Mold hyphæ appeared in one October sample. Rhizopods and Mastigophora were not found. Infusoria were represented by a few *Codonella* in one sample, about 500 per liter. Rotifera were absent, except one doubtful specimen in one sample. The crustaceans, *Cyclops* and *Bosmina*, appeared in both samples, as did also an uniden-

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tified worm, evidently a Nematode. These samples show a decided decrease in the number of organisms as compared with September samples. The presence of *Oscillatoria*, mold hyphæ, and minute worms (Nematodes) indicate a contaminated water.

No further collections for Plankton data were taken here until the following May. The broad expanse of shallow water was so stirred up by the prevailing spring winds that turbidity sometimes reached 250 and over, making it impossible to filter accurately a water sample of sufficient size to give reliable data. This condition changed rapidly, however, as soon as submerged plants got a start. The bottom mud was thus protected, and the shallow water itself steadied and held in place by the stems and leaves of innumerable plants. At first the plants can not grow rapidly, because the turbid water shuts out the sunlight; and, conversely, the water is turbid because the plants are not there to protect the bottom mud from agitation due to winds.

One sample, secured May 26, contained 22,000 standard units of *Oscillatoria* per liter, a few Rhizopods (*Arcella* and *Difflugia*), and *Rotifer actinurus* of the contaminate organisms. Various diatoms, chiefly *Navicula*, were present; also the green alga *Scenedesmus* and a few crustaceans, chiefly *Cyclops*

The Plankton content of all these samples bears testimony to the fact, already recognized, that sewage is present. In other words, the contamination of the water is reflected in the Plankton content. On the other hand, it is worthy of note that the contamination apparently is not very great even at this point, so close to the sewer. It seems that some very effective purifying agency is at work. Either the sewage is being disposed of rapidly or the apparent purification is brought about by the very large amount of well-oxygenated dilution water renewed twice daily by tidal action.

Mud samples were collected at two points, 100 feet and 300 feet, respectively, from the mouth of the sewer. The samples nearest the sewer showed, in April, a black, somewhat granular, mud, with noticeable "privy" odor. Tubificid worms were numerous, together with many egg capsules containing eggs or young. One dead snail was in this sample. Much gas arose when the mud was disturbed. Another sample taken at about the same place May 1 showed similar odor and color, but only 15 tubificid worms were found in the 200 c. c. sample.

Mud taken from the flat only 25 feet away from the mouth of the sewer showed few *Tubifex* or tubificid worms, some *Chironomus* larvæ, and contained the characteristic sewage organisms, *Paramoecium* and *Colpidium*, of the Infusoria. The sewage fungus *Sphaerotilus*, shreds of toilet paper, and the contaminate organism *Euglena viridis* were also present.

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Mud samples taken 300 feet from the sewer showed a consistent increase in organisms, indicative of cleaner water. April samples were black, but had only a slightly unpleasant odor. Tubificid worms numbered only three to six per plate. *Chironomus* was present in similar numbers. Acarina ("water spider") was found in one sample. Univalve mollusks, *Planorbis parvus* and *Amnicola limosa*, appeared in two of the three samples taken in this month, totaling 14 of the first organism and 23 of the second in the two samples. One young mussel was found.

It thus appears that the evidence furnished by the inhabitants of the bottom mud is confirmatory of that already secured by examination of the plankton organisms.

Point G.—This point was in mid-flat. The water was 4 to 5 feet deep at low tide. Submerged vegetation was very plentiful during summer and autumn, persisting until November. *Vallisneria spiralis*, *Ceratophyllum*, and *Potamogetons*, with considerable algæ at times, formed the bulk of this vegetation. In late fall the dormant eel grass was densely covered with a luxurious growth of diatoms, chiefly *Cocconema*.

Plankton samples in August showed no evidence of sewage contamination, with the possible exception of the rhizopods, *Arcella* and *Difflugia*, which were present in very small numbers. Blue greens, mold hyphæ, Mastigophora, and contaminate infusoria were absent. September samples gave scant evidence of contaminate conditions. *Clathrocystis* and *Cylindrospermum* of the blue greens were present in small quantity. A few *Difflugia* (600 per liter) were found in one sample and 500 per liter of *Rotifer vulgaris* in another. In October a small amount of *Oscillatoria* was present. The diatom *Synedra* numbered about 14,000 to the liter. No rhizopods, mastigophora, or infusoria were found. November samples likewise showed no contaminate forms, with the possible exception of *Difflugia*, which appeared in one sample.

A sample taken in May, 1914, contained Infusoria that ordinarily indicate contaminate conditions. These organisms were *Tintinnus* and *Epistylis*, both present in small numbers only. It is possible that these organisms were brought from the small sewer run a third of a mile distant, or from the river channel, half a mile away, inasmuch as the submerged plants were not yet grown to such size as would check the rapid sweep of tidewater over the flat.

The evidence obtained by plankton examination of eight samples collected at this point is distinctly indicative of water of good quality.

Mud samples taken at this point in mid-flat were uniformly yellow in color, soft, and somewhat granular in consistency, and with the fresh odor characteristic of ordinary mud. In April the univalve

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mollusks *Planorbis trivolvis* and *Lioplax subcarinatus* were quite abundant. A few other varieties were present, but not so numerous as the foregoing. Bivalves (*Unio*) appeared in three of the four mud samples collected in April. *Anchylus*, a univalve mollusk, was found once. The crustacean *Gammarus* was found in two samples and caddis-fly larvæ in one. Unfolding buds of *Ceratophyllum* and *Potomageton* were found in three of the April samples. No other plant life was observed. Organic remains, in the shape of snail shells in various stages of disintegration, were plentiful.

Samples in May contained the univalve mollusks, *Lioplax subcarnatus*, *Amicola limosa*, *Planorbis trivolvis* and one or two unidentified species. Bivalves (*Unio*) were present also. May-fly larvæ (*Ephemera vulgata*) were found in both samples, and in the last sample taken, May 12, were two tubificid worms. Plants present were the slowly starting submerged varieties, eel grass and Potomagetons. Organic remains consisted of a few snail shells, empty cases of caddis-fly larva, and rootlets of aquatic plants.

Point M.—A few plankton samples taken at this station during October and November, in connection with the chemical samples, gave results so similar to those obtained at point G, half a mile distant, that full details of counts would be needless repetition. One or two slight but significant points of difference are worthy of mention.

It will be remembered that this point is located in the broad swash channel, through which most of the water ebbs and flows in passing on the flat or returning from it; it is perhaps 300 yards from the main river channel. The average depth of nearly 5 feet (mean low tide) permits the passage of flood tide water quite readily over this intervening space, even in summer, as submerged vegetation is less crowded in this deeper water. It is therefore probable that water samples taken here will have been subjected to a very brief time factor in transit from the river channel. That this is a fact rather than a probability seems apparent from the presence in the plankton of certain contaminate organisms which are not found in mid-flat samples, hence they are probably brought direct from the river channel by flood tide. Furthermore, most of these organisms are found in the plankton of the river channel at Fort Foote, just below the flat.

In mid-flat samples (taken at point G) the diatom *Synedra* (regarded by many as a contaminate organism) is the most numerous diatom in four of the eight samples, whereas in the samples under consideration it is the leading diatom in five samples out of six.

In mid-flat samples contaminate organisms of the Mastigophora and Infusoria were represented by two species only, and both were

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in one sample, that of May 26; whereas these swash-channel samples show one genus of Mastigophora and seven genera of Infusoria, all contaminate organisms, in addition to two forms, *Dinobryon* and *Codonella*, which are not especially typical, but seem to be indifferent to sewage contamination. The contaminate forms present are *Euglena viridis*, *Halteria*, *Colpidium*, *Enchelys*, *Epistylis*, *Stylonchia*, *Tintinnus*, and *Vorticella*. It would seem, therefore, that the proximity of this collecting point to the river channel is indicated by the presence in the plankton of those organisms which find their food supply in the bacteria attending the decomposition of organic matter, which process has not yet had sufficient time to complete its work and to banish these contaminate organisms by removing their food supply.

Mud samples taken at this station during April and May were essentially similar to those taken in mid-flat at point G, the animal life consisting largely of the univalve mollusks *Planorbis*, *Amicola*, *Goniobasis*, and *Lioplax;* the bivalve *Unio complanatus*, *Gammarus* of the crustacea; and the larvæ of May fly and caddis fly. Sponges and Bryozoa (*Fredericella*) appeared in one collection. One leech and two tubificid worms were found. Six samples were taken here during the two months. All samples were yellow or yellowish in color, with no special odor, and were granular rather than soft. Two mud samples taken in this locality, but much nearer the river channel (just on the edge of the flat), showed a few tubificid worms in both samples.

DISSOLVED GASES AND THE EFFECTS OF PLANTS.

The factors affecting the amount of free CO_2 in water are: (1) Production by bacterial activity and the presence of decomposing matter; (2) production by animal life in water; (3) absorption of CO_2 from atmosphere (to these may be added the stirring up of highly organic mud in shallow water by wind or other agency); finally, (4) absorption of CO_2 by submerged green plants; and (5) temperature.

The factors relating to dissolved oxygen in water are, in brief—(1) aeration, subsidiary considerations being depth of water and area exposed to air, agitation by wind or other agency and quality of mud thus stirred up, if in shallow water; (2) depletion of oxygen by bacterial activity or contained organic matter; (3) depletion by oxygen-using animal life in water; (4) production of oxygen by submerged green plants, this process being dependent on presence of sunlight and the absence of turbidity; (5) temperature.

Many of these factors affect the plankton organisms, either directly or through the changes produced in their environment. Bacterial

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CHART J.-DISSOLVED GASES.-HUNTING CREEK FLAT.-STATION C.F.

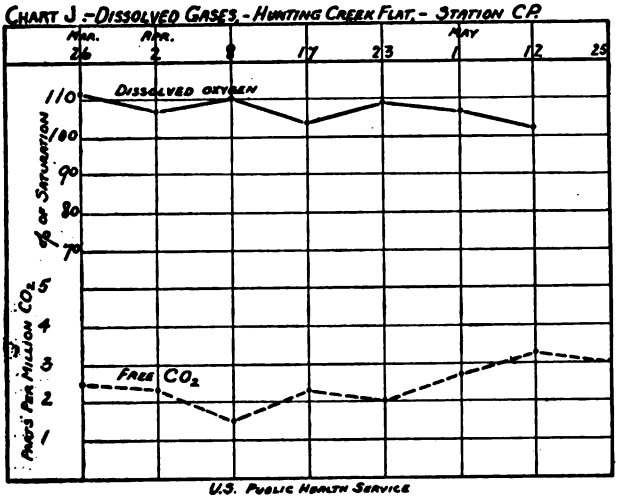

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CHART K.-DISSOLVED GASES.-HUNTING CREEK FLAT.-STATION F.

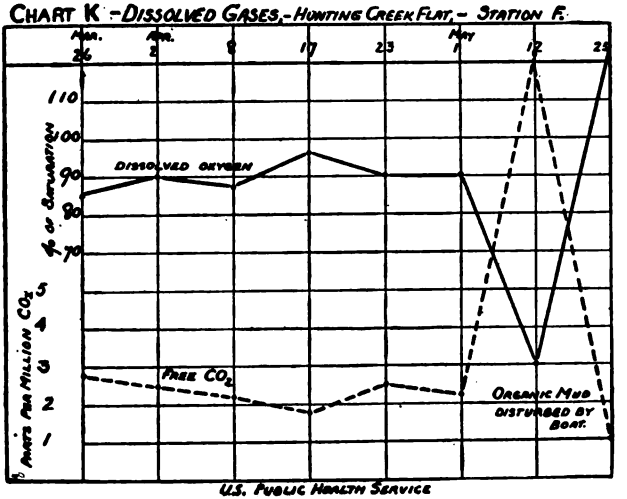

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CHART L.-DISSOLVED GASES,-HUNTING CREEK FLAT.-STATION G.

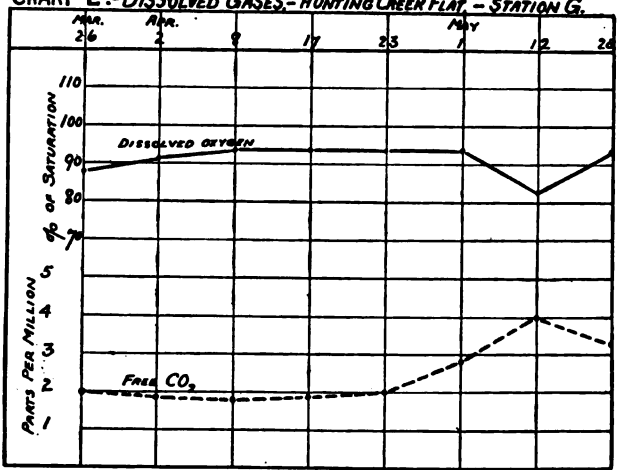

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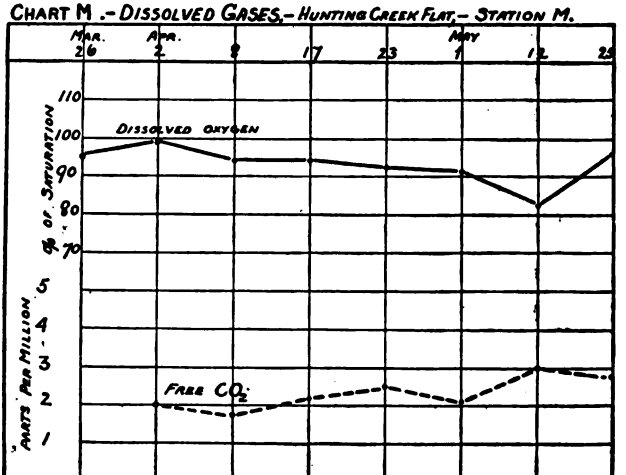
CHART M.-DISSOLVED GASES,-HUNTING CREEK FLAT,-STATION M.



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activity causes a sudden increase of those forms, chiefly Mastigophora and Ciliata[1] that feed on bacteria or on decaying matter or on both.

The "chain of food relations" thus started does not end here, but goes on indefinitely. Again, life and activity of microscopic animals will deplete the oxygen of the water and add to its CO_2 just as surely as this takes place in the aquarium containing goldfish. Further, the minute green plants, the phyto-plankton, demand CO_2 and produce oxygen by the process of photosynthesis, as the larger plants do. The presence of very large numbers of these microscopic plants compensates for their lack in size. Finally, the fluctuating amounts of CO_2 and dissolved oxygen in water may result largely from the life and activity of submerged plants, large and small, and from the action and interaction of the related factors of sunshine, turbidity, water movements, and the activity of animal planktonts, or zooplankton, as well as of larger animal life.

Relation between dissolved oxygen and plankton.—Numerous observations in the field, supplemented by laboratory examinations of water to ascertain gaseous content, indicate that intimate interrelations exist between certain of these factors of the plankton environment. A partial summary of field observations and laboratory tests is given in Tables 29 and 30. The samples for laboratory examination were taken as indicated at points F, G, M, K, and CP, the latter point being the river channel just above the flat. Reference to Map No. 8 will show the relative location of all points.

[1] Bull. Illinois State Laboratory Nat. Hist., Vol. VIII, Art. I, pp. 63, 117, 120, 126.

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TABLE 29.—*Showing the relation between various factors and amounts of dissolved oxygen present.*

Date.	Hour.	Collecting point.	Depth of sample.	Temperature (° C.).	Turbidity.	Tide.	Weather and environment.	CO_2 (p. p. m.).	Dissolved oxygen per cent of saturation.	Bacteria.		
										37°	20°	B. coli (c. c.).
1914.			*Feet.*	°								
Mar. 26	11.30	CP	7	8	45	Half ebb....		2.5	102	1,200	80,000	+ in 0.01
26	12.00	F	2	10	250	.....	Diffused sunshine; breeze; waves and light swell.....	2.8	85.5	1,150	130,000	+ in .1
26	1.00	G	3½	10.5	130	.....		2.0	88	550	32,000	+ in .01
26	2.00	M	4	11	110	.....		.....	94	350	30,000	+ in .1
Apr. 2	3.30	CP	8	11	55	Third ebb...		2.3	97	.....	.....	.....
2	1.00	F	1	11	150	High flood..	Little sunshine; clouds; stiff breeze; waves and swell; water rough.	2.5	90	32,500	525,000	+ in .01
2	2.00	G	7	11	60	.....do.....		.....	.....	5,500	53,000	+ in .1
2	3.00	M	4½	11	110	High ebb....		2.0	99	1,700	21,500	+ in .1
8	12.00	CP	8	13.5	45	Three-fourths ebb.		1.5	100	7,100	19,000	+ in .001
8	12.00	F	1	14.5	300	.....do.....	Total overcast; strong south wind; showers frequent.....	2.2	87	8,300	70,000	+ in .001
8	1.00	G	4	14	100	Low ebb....		1.8	94	800	.....	− in .1
8	2.00	M	5	14	60	Turn of tide.		1.7	94	2,400	14,000	+ in .001
17	12.00	CP	8	11	100	Three-fourths flood.		2.3	94	23,200	220,000	+ in .1
17	2.30	F	2	14	45	High ebb....	Sunshine; light breeze.....	1.8	96	3,900	46.000	+ in .1
17	2.00	G	4	13	65	Flood.....		.....	94	3,600	21,000	− in .1
17	1.00	M	4	12.5	45	High flood..		2.2	94	3,300	20,000	+ in .01
23	12.00	CP	8	15	45	Two-thirds ebb.		2.0	99.5	2,500	7,000	+ in .001
23	12.00	F	2	15.5	50	.....do.....	Sunshine; calm.....	2.5	90	6,300	10.000	+ in .001
23	1.00	G	4½	16	60	Low.....		2.0	94	1,600	9,000	+ in .01
23	1.30	M	4	16	70	.....do.....		2.5	93	2,500	10,000	+ in .01
May 1	12.00	CP	8	18	110	High flood..		2.7	97	60,000	160,000	+ in .01
1	1.00	F	1	18	100	High ebb....	Light overcast; diffused sunlight; light breeze; submerged plants appearing in places on flat.	2.3	90	35,000	185,000	+ in .001
1	2.00	G	5	18	110	.....do.....		2.8	94	15,500	42,000	+ in .01
1	2.30	M	4	18	120	.....do.....		2.1	92	34,000	222,500	+ in .01
12	1.00	CP	7	21.5	50	One-third ebb.		3.3	92	2,600	.....	+ in .01
12	1.00	F	1	25	70	.....do.....	Sunshine; light breeze; at F bottom sediment was stirred up by boat.	11.4	40	16,500	.....	+ in .001
12	2.00	G	4	23	55	Low ebb....		4.0	83	3.300	.....	+ in .01
12	3.00	M	4	23	65	.....do.....		3.0	83	3,000	.....	+ in .01
26	1.00	CP	5	24	30	Two-thirds ebb.		3.0	.....	.....	.....	.....
26	4.00	F	1½	28	35	Low flood...	Sunshine; light breeze; submerged plants growing in many places; large amount of Potamogeton crispus at F.	1.0	125	.....	.....	.....
26	3.00	G	3	25	35	Turn of tide.		3.3	93	.....	.....	.....
26	3.00	M	3+	25	35	Low flood...		2.8	96	.....	.....	.....

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TABLE 30.—*Showing the relation between various factors and dissolved oxygen.*

Date.	Hour.	Collecting point.	Depth of sample.	Temperature (°C.).	Turbidity.	Tide.	Weather and environment.	CO_2 (p. p. m.).	Dissolved oxygen, per cent of saturation.
1913.			*Feet.*	°					
Oct. 15	11.30	K	9	17	28	Half ebb..		.....	65
15	11.30	K	4	17	28	...do.....	Partial overcast; diffused sunshine; much eelgrass and algæ present	.....	66
15	10.00	M	3½	16	20	Ebb.....		.....	73
15	11.00	J	.....	.....	.....	...do.....		.....	−62
22	4.00	K	4	13.5	16	...do.....		.....	83
22	5.00	M	4	13	12	...do.....	Sunshine; light breeze; eelgrass and algæ abundant	.....	111
22	5.00	M	2½	13	12	...do.....		.....	72
22	11.00	J	.....	.....	.....	High.....		.....	−79.5
29	11.00	K	8	14.5	180	Ebb.....		.....	89
29	10.00	M	4	14.5	15	...do.....	Sunshine; hazy clouds; water very muddy in river channel (250 turbidity); submerged plants partly obscured by turbidity	.....	89
29	10.00	M	3	14	35	...do.....		.....	85
29	11.00	J	.....	.....	250	...do.....		.....	60.7
Nov. 5	4.30	K	7	11	30	...do.....		2.9	89
5	3.00	M	4	11	24	...do.....	Sunshine; nearly calm; eelgrass, tipped with bunches of *Spirogyra*	.....	104
5	3.00	M	4	10	24	...do.....		1.4	101
5	11.00	J	.....	.....	.....	.....		.....	85.6
12	11.00	K	7	7	250	...do.....		2.0	96
12	10.00	M	3+	6	70	...do.....	Sunshine and hazy clouds; eelgrass and *Spirogyra* abundant	2.0	89
12	10.00	M	4+	6	28	...do.....		2.5	92
12	11.00	J	.....	.....	.....	...do.....		.....	101.
19	5.00	K	7	9	50	...do.....		2.5	91+
19	4.00	M	4	8.5	35	...do.....	Slight overcast; calm; mud-laden eelgrass; algæ on tip	2.5	87
19	11.00	J	.....	.....	.....	High.....		.....	100
26	11+	K	8	8.5	45	Ebb.....		2.0	81
26	10.00	M	4	9	40	...do.....	Raining; eelgrass still retains place on flat	1.3	84
26	11.00	J	.....	.....	.....	...do.....		.....	84.5

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In aquatic plants and animals, including microscopic forms, there is a sort of reversal of the relative conditions required by land organisms. The latter grow in air, their natural medium, and require much or little water, but they must have water. The aquatic organisms grow in water, their natural medium, but they must have certain amounts of the gases to be found in air. Submerged green plants, like land plants, utilize inorganic food material, chiefly CO_2 and water, in the manufacture of their food and give off an excess of oxygen as a waste product, this activity depending largely on the access of sunlight to the chlorophyll within the plant cells. This process, photosynthesis, produces both chemical and biological effects, the former being the addition of oxygen to the surrounding water and the extraction of CO_2 from it, and the latter, or biological, effect being the increased activity of oxygen-using bacteria, and of animal life, microscopic and larger, made possible by the renewed supply of oxygen to the water. These animal forms, in turn, produce CO_2, which may be utilized by the green plants. To a certain extent the respective activities of the aquatic plants and animals are reciprocal.

The plants thus become a factor of considerable importance in the economy of the river. In addition to the enforced sedimentation and clearing of the water and the prolonged period for biological action in the sewage-laden water brought in by the flood tide, there is the equally important reoxygenation of the water by these plants meantime, thus furnishing to the aerobic bacteria and microscopic animals the means of continuing their activity in the so-called self-purification of the river. In support of this statement there is appended the following condensed tabulation showing the average dissolved oxygen content of 27 samples taken from the flats and of 12 samples taken from the adjacent river channel on the same days:

TABLE 31.—*Dissolved oxygen on flats and in channel.*

Sampling point.	Number of samples.	Dissolved oxygen content, percentage of saturation.		
		Highest.	Lowest.	Average.
Flats	27	128	57	87
River channel	12	102	50	71

The samples were taken September 3 to November 12, inclusive. Plants were much reduced in numbers and activity in November. Eelgrass, though inactive, was still present, and was covered with a mass of diatoms (chiefly *Cocconema*) and tufts of *Spirogyra*. Both the algæ and the diatoms contained the synthetic work of the defunct eelgrass.

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If the data in the preceding table be arranged with reference to tidal conditions when samples were taken, we have the following:

TABLE 32.—*Dissolved oxygen at high tide and at low tide.*

Sampling point.	Number of samples.	High or rising tide—dissolved oxygen (percentage of saturation).			Number of samples.	Low or falling tide—dissolved oxygen (percentage of saturation).		
		Highest.	Lowest.	Average.		Highest.	Lowest.	Average.
Flats	8	128	57	83	19	127	62	88
River channel	8	86	60	67	4	102	50	76

These results indicate that the rising tide floods the flats with water which is lower in dissolved oxygen than the water already on the flat, and that the ebb tide carries to the river channel a volume of water relatively higher in dissolved oxygen than the channel water itself. This matter will be discussed quantitatively in a later section.

Sunlight and turbidity.—Oxygen production by green plants depends on sunlight, and this, in turn, may be greatly reduced by clouded skies, or entirely shut off from submerged plants by turbidity of the water.

If the dissolved oxygen data from the flats be arranged with reference to sunny and cloudy days when samples were collected we have:

TABLE 33.—*Sample collected from flats on sunny and cloudy days.*

Sky.	Number of samples.	Dissolved oxygen (percentage of saturation).		
		Highest.	Lowest.	Average.
Sunny	16	128	72	99
Cloudy overcast	11	87	57	69

If from the above sunny days we exclude five, on which the water had a turbidity of 30 or over (sufficient to exclude most of the sunlight), and place these readings with those of the cloudy days, we have an average of 103 per cent dissolved oxygen for the sunny days and 75 per cent for the cloudy.

If it be true that water on the flats is higher in dissolved oxygen because of plant activity during sunny days, then it follows that water in the river channel also should exhibit increase of dissolved oxygen during these days, because of the oxygenated water received from the flats during ebb tide. This is shown in a measure by Table 34, following. (In this table the first week in September is omitted because of absence of data concerning local weather conditions.)

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TABLE 34.—*Dissolved oxygen (percentage of saturation) on cloudy and sunny days.*

	Three Sisters.		Below railroad bridge.		Giesboro Point.		Fort Foote.	
	Cloudy.	Sunny.	Cloudy.	Sunny.	Cloudy.	Sunny.	Cloudy.	Sunny.
1913.								
Sept. 8	.....	90.6	.....	60.5	.....	39.2	.....	46.2
Sept. 9	.....	92.6	.....	80.1	.....	59.3	.....	47.4
Sept. 10	.....	87.2	.....	76.7	.....	48.5	.....	52.5
Sept. 11	.....	91.2	.....	85.1	.....	63.9	.....	50.1
Sept. 12	.....	94.2	.....	79.1	.....	66.9	.....	46.8
Sept. 13	.....	93.4	.....	71.8	.....	64.6	.....	42.2
Sept. 15	.....	95.7	.....	73.1	.....	66.4	.....	56.9
Sept. 16	.....	.....	.....	.....	.....	.....	.....	66.4
Sept. 17	96.4	.....	76.3	.....	64.0	.....	60.0	.....
Sept. 18	97.5	.....	75.3	.....	57.1	.....	59.0	.....
Sept. 19	100.8	.....	68.9	.....	53.3	.....	58.5	.....
Sept. 20	90.1	.....	56.9	.....	40.4	.....	58.8	.....
Sept. 22	.....	.....	.....	.....	.....	.....	.....	.....
Sept. 23	.....	96.8	.....	83.9	.....	68.4	.....	58.4
Sept. 24	.....	96.2	.....	80.1	.....	66.8	.....	59.6
Sept. 25	.....	94.9	.....	79.4	.....	68.1	.....	63.2
Sept. 26	.....	91.6	.....	82.9	.....	70.4	.....	57.3
Sept. 27	.....	.....	.....	87.9	.....	78.6	.....	68.5
Sept. 29	.....	99.6	.....	89.9	.....	74.9	.....	60.7
Sept. 30	.....	99.0	.....	88.6	.....	69.4	.....	56.5
Average	96.0	94.0	69.0	80.0	54.0	65.0	59.0	55 0

It will be noted that there is no essential difference in favor of sunny days in samples taken at Three Sisters. This, however, is entirely consistent, because this collecting point is in the narrow, upper river, before the water has had access to plant-filled flats. Plants are not a factor in this part of the river, hence sunny days produce no excess of oxygen in the water. At the other collecting points named, the water has had access to flats containing large amounts of submerged plants. As a result, the sunny-day samples show a distinct increase in dissolved oxygen.

At Fort Foote the results as shown seem to be inconsistent. However, it is possible that the process of decomposition, inaugurated by the recent addition, only 4½ miles above, of the sewage of Washington, are so vigorous at times as to mask the addition of oxygen from the flats. Turbidity records for the channel are lacking, but such turbidity would be no essential factor in this instance, because the water whose dissolved oxygen content is concerned is that contributed from the flats to the channel. There are no plants of importance in the channel, neither is there turbidity on the flats at this season. The dissolved oxygen data from Fort Foote for the succeeding month of October show an average of 61 per cent of saturation for samples taken on cloudy days and an average of 78 per cent of saturation for sunny-day samples. In this month the cloudy and sunny days are more evenly distributed, there being 14 of the one and 13 of the other, and it would seem that the average readings, as given, would therefore be significant.

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A summary of the data from Fort Foote during September, October, and November (to the 15th) gives the dissolved oxygen readings for sunny and cloudy days arranged, in Table 35, with reference to tides:

TABLE 35.—*Dissolved oxygen averages at Fort Foote with reference to tides and sunshine.*

Month.	Samples collected during low tide.		Samples collected during high tide.		Average dissolved oxygen (percentage of saturation)—	
	Cloudy.	Sunny.	Cloudy.	Sunny.	At low tide.	At high tide.
1913.						
September	6	3	.....	.....	61	.....
Do	.....	.....	0	9	.....	25
October	9	7	.....	.....	70	.....
Do	.....	.....	8	2	.....	67
November (to Nov. 15)	4	4	.....	.....	93	.....
Do	.....	.....	2	3	.....	83

These samples were collected about the same hour (11 o'clock) each day, hence the ebb-tide water had been exposed to only a part of the plant activity for that day. It is probable that samples taken in the late afternoon would have shown a much higher percentage of dissolved oxygen. That this is so is indicated by Table 36, here given.

TABLE 36.—*Dissolved oxygen content of water ebbing from Hunting Creek Flat, forenoon and afternoon samples.*

Collecting point.	Symbol.	Number of samples.		Average dissolved oxygen (percentage of saturation.)
		A. M.	P. M.	
Smiths Point	M	6	.....	85
Do	M	.....	5	95
Keystone Channel	K	5	.....	79
Do	K	.....	3	88

These samples were taken from Hunting Creek Flat, just above Fort Foote, during October and early November, while plant life (submerged) was still somewhat active. The collecting points were carefully chosen so samples would faithfully represent the average water ebbing from the flat. All samples were taken during strong ebb tide, and at a depth equal to about three-fourths the total depth of the water at the collecting points, the locations of which, designated by M and K, respectively, are shown in Map No. 9.

Aerating capacity of tidal flats.—The results of Tables 35 and 36 can now be utilized in a quantitative computation of the aerating capacity of these tidal flats. Having in mind the important fact that

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the capacity of any stream to receive and oxidize sewage, without depleting its available oxygen to the nuisance point, is determined primarily by its capacity for reaeration, a quantitative estimation of the reaerating effect of tidal flats covered with vegetation is a matter of some importance.

The character of water going to the flats from the river is indicated by the average condition at high and low tides at Fort Foote, immediately below these flats. This condition is shown in Table 35, taking the average of all October and November figures to be 75 per cent of saturation. Assuming that approximately twice as much water leaves the flats by the Smith Point Channel as by the Keystone Channel, an assumption which is reasonably accurate, the average character of that water is found from the data of Table 44 to be 83 per cent saturated following a night flood tide, and 93 per cent saturated following a day flood. The increase is therefore 8 per cent of saturation for night tides and 18 per cent of saturation for day tides, a total of 26 per cent of saturation for the entire tidal prism during each 24 hours. At the average temperature obtaining during the months of October and November the saturation point of oxygen in water is approximately 10 parts per million. The tidal range over the same period was approximately 30 inches.

Computing the results per acre of tidal flats, it is found that the production of oxygen amounts to about 17.7 pounds per acre per day. The Washington sewage during this same period had an oxygen demand, as will be shown later, of approximately 300 parts per million; that is, 1,000,000 gallons of sewage requires for its ultimate oxidation biologically, 2,500 pounds of oxygen. One hundred and forty-one acres of tidal flats, under the conditions obtaining in September and October, therefore produced sufficient oxygen for the complete biological oxidation of 1,000,000 gallons of sewage.

The true effect of this aerating system is very largely masked by one important fact—namely, that these flats are themselves extensively polluted by the sewage of Alexandria, and the tidal flow upon them is also polluted by the sewage of Washington. The actual oxygen production of the flats must therefore be greater than the figures calculated above by the total oxygen demand of the Alexandria sewage which passes through this region, and the 12-hour oxygen demand of that fraction of the Washington sewage which ebbs and flows over these flats.

Effects of temperature.—It is important also to note the temperature relations. Biological activities were very much less during the time of these observations than during the warmer summer months, and it is probable that during the summer season, which is coincident with the period of greatest danger from physical nuisance, the aerating capacity of these flats is much greater than the figures

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indicate. On the other hand, during the winter months, this aerating capacity is of little, if any, significance. It will be of interest to record for comparison that these flats, under the conditions noted, furnish a means for the complete oxidation of sewage at a rate in excess of 7,100 gallons per acre per day, while artificial sand filtration of sewage is carried on at rates from 10,000 to 100,000 gallons per acre per day. With an area of 1.3 square miles Hunting Creek Flat is apparently able to complete the oxidation of all the Alexandria sewage which enters it and also to provide for the complete oxidation of nearly 6,000,000 gallons per day of the sewage from Washington. If, instead of the total, the 24 hours' oxygen demand be used in this computation, this result is increased approximately fivefold. In other words, this flat will provide sufficient oxygen for the first 24 hours' natural purification of nearly 30,000,000 gallons of Washington sewage. As it is this first 24 hours' demand which constitutes the critical point in stream pollution, this figure is of more definite significance and doubtless explains in large measure the relatively slight effect of the Washington sewage in decreasing the oxygen of the Potomac River at points below.

That this oxygenation is in the main biologic rather than physical, due to mere exposure upon the flats, is indicated in Tables 29 and 30. The average condition of the flood waters in the river was 67 per cent of saturation, of the waters over the flats during the cloudy days of the same period, 69 per cent. The average condition being exposure of the flat waters for half a tide, it may be assumed that the change for a whole tide would be twice as great, indicating an increase of 4 per cent of saturation. This value is lower than that of the night floods of Table 34, which show an increase of 8 per cent of saturation; but these tides, being in reality forenoon ebbs, had certain hours of daylight. Upon cloudy days, however, with the photographic intensity of actinic rays ranging from 3 per cent to 10 per cent of full sunshine, following eight hours of darkness, the biologic oxygenation is reduced to its lowest term. Purely physical re-aeration, therefore, is certainly not over 33 per cent of the total effect, and if proper allowance could be made for the residual biologic action upon cloudy days, perhaps 6 per cent of full sunshine, this figure would be materially reduced.

TIDAL ACTION ON THE FLATS.

The tides in the Potomac River constitute an automatic device whereby nature lifts vast quantities of contaminated river water and spreads it over the large area of the flats, which in summer are equipped with effective bafflers and oxygenating apparatus—the plants. For six hours the water is slowly pushed into these renovating delay stations; then, for an equal period, the mixed water is

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slowly drawn back into the channel, possibly to repeat the process farther down the river. Unlike man's purifying devices, this apparatus works day and night, without attention and without expense. Furthermore, the machinery of this water purification plant is absolutely "fool proof."

Movements of tidewater on the flats are strikingly similar to the movements of air in the lungs. Ordinary tides correspond to ordinary breathing—a very high tide is analogous to a deep inhalation of air and a very low tide is similar to an enforced exhalation. Finally, the "residual air" in the lungs typifies the large body of "residual" water which remains on the flats, continually renewed, constantly depleted, yet never exhausted.

By checking the normal current the flood tide virtually makes a vast sedimentation basin of a large part of the river, and greatly increases the time required by the water to reach a given point downstream. Time rather than distance is of utmost importance to permit the breeding of those organisms, both bacteria and plankton, whose activity results in the destruction of organic matter. This time factor, together with resulting improvement of the water, is further increased by the spreading out of water on the flats. It seems reasonable to suppose that this water, pushing its way slowly through the submerged plants and mixing thoroughly with the residual water, must be subjected to prolonged sedimentation, aeration, and general readjustment of chemical and biological conditions.

The amount of the improved water returning to the channel at ebb tide is considerable. An estimate of the daily contribution of Hunting Creek Flat, with an area of 1.3 square miles and an average tide of 30 inches, shows that this flat alone pours into the channel about 167,720,000 cubic feet in 24 hours, and that the combined contributions of the 10 square miles of flats between Washington and Marshall Hall will be approximately equivalent in 24 hours to a tributary whose discharge is 14,520 cubic feet per second. This is about equivalent to the Alleghany River at Kittanning, Pa., at half-flood stage; or to the Muskingum, at Zanesville, Ohio, at medium-flood stage; or to the Ohio River at Wheeling, W. Va., at low-water stage; or to the Wabash, at Terre Haute, Ind., at medium flood. Thus a large part of the water is subjected on the flats to a long period of general improvement through biological, chemical, and physical factors brought into action by this temporary impounding of the water by the tides, in these delay stations of the Potomac.

DECAY OF SUBMERGED PLANTS.

In late fall the submerged plants disappear slowly. Weakened by decay, many of them are broken from their attachments in the bottom mud and are carried out to the channel by the ebb tide. As

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the plants are thus thinned out, tides increase in force on the flat, because of the gradual removal of these plant barriers. Finally, the ice, floating out in the spring, removes much of the débris that may have resisted the force of the tidal water.

It seems reasonable that the decay of this large amount of organic matter should have some injurious effect on the water, but accurate data are lacking. However, as far as we can judge from the amounts of dissolved oxygen and free CO_2 in the water, it seems that there is no special bacterial activity in November, for instance, when most of the plants have completed their work and are being swept out by the tide. During this month, or from November 5 to 26, ten samples of water (see Table 30), taken at points K and M (see Map No. 9), during strong ebb tide, showed on an average a dissolved oxygen content of 91 per cent of saturation and an average CO_2 content of 2.1 parts per million. These results do not indicate any particular activity as to bacterial decay.

During this same period of time, however, the average dissolved oxygen in the adjacent river channel at Fort Foote was 93 per cent of saturation. This small increase over the amount found in ebb-tide water from the flat might be interpreted as an indication of a slight increase in bacterial activity on the flat.

During the period from March 26 to May 26, 1914, 22 samples from Hunting Creek Flat (see Table 29) gave an average of 2.4 parts per million CO_2 and 93 per cent saturation of dissolved oxygen. (This does not include sample taken at F May 12, when organic mud, stirred up by the boat, gave to the water high CO_2 and low dissolved oxygen content). During the same period, eight samples collected from the river channel at CP (just above the flat) showed an average of 2.5 parts per million of CO_2 and 97 per cent saturation of dissolved oxygen. Thus the relative conditions of channel water and flat water were about the same as in November, though decaying plants were absent.

It is possible that the decay of the plants takes place so gradually that their retreat is covered by the excess of oxygen provided by the plants which remain for the time being. Submerged plants are protected from the extremes and sudden changes of temperature which assail land plants and check their activity. Autumn frosts do not menace the aquatic forest. Some of these submerged plants continue their activity far into November, and one or two varieties occurring in small quantities seemed to the writer to be as green and active as ever on November 26.

The products of decay of these larger plants are apparently utilized by certain microscopic algæ, such as *Scenedesmus* and *Raphidium*. The minute alga *Coleochaete* grows luxuriantly on a fragment of decaying water plant, as moss grows on a rotting log. An

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experiment by the writer demonstrated that water plants, decaying in a jar of water, may be accompanied by microscopic algæ in such numbers that a distinct oxygen reaction is produced when a fragment of the decaying plant is placed in fresh hemotoxylin solution. In this instance the microscopic plant was a plankton organism (*Scenedesmus*) which is very common in Potomac water.

In the late fall the tips of eelgrass (which, though apparently dormant, retains its hold on the bottom mud until late in November) are seemingly covered with mud for a distance of 1 to 2 feet of the blade. On inspection this covering is found to consist chiefly of diatoms, principally *Cocconema*, whose brown color gives the appearance of mud. On placing a piece of this diatom-covered eelgrass in the hematoxylin solution, and exposing to a bright sunlight, a distinct and vigorous oxygen reaction resulted in less than half an hour.

It thus seems probable that the presence of innumerable microscopic plankton organisms such as *Scenedesmus* and diatoms may by their synthetic action produce quantities of oxygen sufficient to counterbalance the products of decay in the larger plants, and may thus maintain a safe oxygen content in the water. This is a most interesting possibility, and one that should be carefully investigated.

TURBIDITY.

The turbidity of Potomac water is due (1) to excessive rainfall and general flood conditions in the upper Potomac and tributary streams; (2) to the stirring up of mud on the shallow flats during winter and spring, when the protective covering of plants is absent. In the spring floating ice stirs up the mud on the shallow margins of the river, and especially when the ice finally floats away from the shallow flats the broken masses stir up the mud, causing high turbidity in the nearby channel. During late fall and early spring, when neither ice nor plants are on the flat, the shallow water is agitated by the wind, the mud is stirred up, and the tide ebbing from the flat carries a flood of muddy water to the channel.

On October 8 the water in the river channel showed a turbidity of 140, while the water 200 to 300 feet away in the flat showed a turbidity of only 13 and 19, respectively. This was due largely to the presence of the plants, which compelled the water from the channel to seep through very slowly to the flat. Conditions similar to this were observed many times. Of 65 turbidity readings taken in the channel and 42 taken on the flats during August, September, October, and November, 25 of the channel readings were less than 20; 19 were 20 or more, but less than 40; 15 were over 40, but less than 100; and 6 were 100 or over; the average was 38. Of the turbidities taken on the flats, 24 were less than 10; 10 were 10 or over, but less than 20; while only 8 showed turbidity of 20 or over. The average was 14, which means water that is very clear.

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On the other hand, on March 26, during a stiff breeze that produced "white caps," the channel water showed a turbidity of only 45, while the water on different parts of the adjacent flat showed turbidities of 100, 110, 130, and even 250, the latter being in the shallowest part of the flat, where the soft mud was continually stirred up by wind-produced waves. Again, on April 28, while the channel turbidity was 45, less than 50 feet away from the channel on the flat the turbidity was 100 and on the shallowest part of the flat the turbidity was 300.

Twenty-six turbidity readings were taken on the flats during March, April, and May, and the same number was taken in the river channel above the flat during the same months. A comparison of these is significant. The shallow flats were not yet protected by the summer growth of submerged plants. Of the channel readings, 9 were less than 40, 14 were between 40 and 100, and 3 were over 100; the average of the 26 readings was 52.5. Readings taken on the flats showed 3 less than 40; 12 were between 40 and 100; 9 were over 100, but less than 200; and 2 were over 200; the average of the 26 readings on the flats was 94+. All the above readings were taken above that portion of the river where the mingling of salt water with the fresh precipitates the suspended matter and tends to produce clear water. All readings were taken with the United States Geological Survey turbidity rod.

DISPOSAL OF SEWAGE ON FLATS.

Inspection of data in Table 29 (exclusive of May 26, when plants were active) will show, concerning points F. G. and M—

1. That dissolved oxygen is lowest at F in every case but one, that being at high tide April 17.

2. That CO_2 is highest at F except in two instances, both at high tide, one instance being the above date.

3. That bacterial counts are highest at F.

4. That in four samples out of 7 water at F is *B. coli* positive in 0.001 cc., samples from other points being distinctly better.

5. That dissolved oxygen values fluctuate but little (omitting, for obvious reasons, the sample taken at F on May 12).

Data in Table 30 show:

1. That ebb-tide water from the flat taken at Keystone Channel is lower in dissolved oxygen and higher in CO_2 than samples taken simultaneously at M.

2. That the average dissolved oxygen of ebb-tide water from Keystone Channel is about the same as that of samples taken from the river channel at Fort Foote on the same days.

3. That dissolved oxygen values fluctuate widely.

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A sewer of moderate size empties near F. (See Map No. 8.) Most of the water from this portion of the flat is conducted to the river channel, three-fourths of a mile away, by Keystone Channel. It is evident that water at F is affected by sewage. Also, samples collected from Keystone Channel at point K still show to a small extent the effects of this contamination, the average gas content here being 2.3 parts per million of CO_2 and 83 per cent saturation of dissolved oxygen, while samples taken simultaneously at M where water from mid-flat passes into the river channel averaged 90 per cent saturation of dissolved oxygen and 1.9 parts per million CO_2. The average dissolved oxygen in the adjacent river channel was 82 per cent of saturation.

The scattered data available are scarcely sufficient to establish anything of value concerning the fate of the sewage. It is significant, however, that the water, so far as examined, maintains a uniformly high degree of excellence as to oxygen content, thus strengthening the evidence furnished by the plankton. By the time the water reaches the river channel the sewage, as such, has practically disappeared. Whether this disposal has been effected chiefly by dilution, by activity of bacteria and plankton, by submerged plant life and consequent increase in dissolved oxygen, or by aeration and sedimentation, or by all of these factors in combination, is an unsettled question.

When the last samples were collected, May 26, submerged plants (chiefly *Potamogeton crispus*) were quite abundant near F, but were relatively few in other parts of the flat. At this time dissolved oxygen at F was 125 per cent of saturation and CO_2 was one part per million. Unfortunately no further collections were available by which these findings might be confirmed.

It is possible that the advent of plant activity provides for the retention and ultimate disposal of sewage entering the flat at this season. There is very rapid development of these submerged plants about the last of May and the first part of June, when they finally overcome the turbidity of the water and gain access to the sunlight. It may be that at such a time food material is at a premium and that the needy plants seize upon any organic material dissolved in the water. Further investigations should throw light on this matter.

POTOMAC ESTUARY.

This includes the lower portion of the so-called river, extending from the region of Maryland Point, 42 miles below Washington, to Chesapeake Bay, a stretch of 60 miles. This body of water, one and three-fourths miles wide at Maryland Point, rapidly widens until, at Colonial Beach, 20 miles below, it is nearly 5 miles in width, this dimension remaining approximately the same to the mouth. The water is brackish, becoming salt toward the lower end. The charac-

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teristics of a bay, rather than those of a river, prevail. For convenient reference, Table 37 gives collecting stations, together with distances from Washington and from Point Lookout. Relatively few samples were taken in the lower river. Organisms indicating pollution were so rarely present that it seemed advisable to confine the investigations largely to that portion of river that showed evidence of pollution and of its gradual disappearance.

TABLE 37.—*Stations on lower river—Distances from Washington and from Chesapeake Bay.*

Stations.	Miles from Washington.	Miles from Chesapeake Bay.	Stations.	Miles from Washington.	Miles from Chesapeake Bay.
Possum Point	24	78	Bretons Bay	78	24
Liverpool Point	32	70	Ragged Point	84	18
Maryland Point	42	60	Piney Point	89	13
Popes Creek	53	49	Sandy Point	91	11
Lower Cedar Point	57	45	St. Georges Island	93	9
Colonial Beach	64	38	St. Marys River	95	7
Blakistone Island	76	26	Cornfield Point	100	2
St. Clements Bay	76	26	Point Lookout	102	0
Nomini Bay	77	25			

TABLE 38.—*Potomac River investigation—Biological samples, lower river, Possum Point to Chesapeake Bay.*

Region included.	District.	Number of samples.				
		Plankton.	Mud.	Submerged plants.	Aquatic animals.	Total.
Possum Point to Colonial Beach (including Liverpool Point, Maryland Point, Popes Creek, and Lower Cedar Point)	I	15	17	5	3	40
Blakistone Island district (including St. Clements Bay, Nomini Bay, and Bretons Bay)	II	7	3	3	4	17
Ragged Point to St. Marys River (including Piney Point, Sandy Point, and St. Georges Island)	III	8	4	4	8	24
Point Lookout (including Cornfield Point, Coan River, and Hog Island)	IV	4	5	3	6	18
Total		34	29	15	21	99

DISTRICT I.

The various collecting points have for convenience been grouped as shown in Table 38. District I represents a stretch of about 40 miles, in which the fresh water gradually becomes brackish and much of the mud is precipitated. The water is usually clear at Colonial Beach in consequence. No polluting material worthy of note is added to the water in this stretch. No tributaries of importance enter the river between the points mentioned in the table, but there are eight expansions or flats of considerable size and a few smaller ones, all of which probably serve as delay stations. The river itself is from one to three miles wide.

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Plankton.—Fifteen plankton samples were taken in District I, six during December, 1913, and nine in May, 1914. December samples showed 12 genera of diatoms; May samples, 8 genera. *Synedra* was the most numerous in only 1 sample, but it was present in 5 samples. Other leading genera were *Navicula* in 6 samples, and *Stephanodiscus* in 9. Blue greens were not found. *Scenedesmus*, of the green algæ, appeared in one sample only, and a small amount of *Conferva* in 2 samples. Mastigophora were represented by *Peridinium* and *Glenodinium*, flagellates which were not found at all in the numerous collections from *Three Sisters* to *Marshall Hall*. *Glenodinium* was found in small numbers in three collections, all from the river channel near Popes Creek, about 50 miles above Chesapeake Bay. Peridinium was present in one of these samples in considerable abundance—32,000 per liter of water. This organism was not found in any other sample in this 40-mile stretch of river.

Infusoria were present in every sample. *Codonella* predominated, appearing in moderate numbers in most of the samples. Another variety of *Codonella*, with posterior part of lorica pointed instead of rounded, appeared in four or five samples. This organism was not found in the plankton of the upper portion of the river. This is true also of another Infusorian found in five of these samples in moderate abundance—1,500 to 4,000 per liter. This organism evidently belongs to the genus *Tintinnus;* the lorica is cylindrical and is constricted near one end, producing a shape similar to that of a long bottle. The rotifer *Anuraea cochlearis* appeared sparingly in two samples. Crustacea were more abundant. *Cyclops* were present in nine samples and the large form, *Acartia*, was found twice. These forms were present in moderate numbers only, reaching 2,000 per liter in one sample.

Bottom samples.—Mud samples, to the total number of 16, were taken from Possum Point, Maryland Point, Popes Creek (river channel), Smiths Point, Lower Cedar, and Colonial Beach. The bottom mud is abundant, very soft, and both granular and sticky. Usually it is yellow on the surface and dark or black beneath. Some samples gave forth no odor, but the majority had an odor indicating somewhat stagnant conditions. Samples from Possum Point contained a very few tubificid worms, four in one sample, two in another, and one *Chironomus* larva appeared in a third sample. One young bivalve mollusk was found. Five samples taken at Maryland Point, 18 miles farther down, yielded two young mussels, the crustacean *Gammarus* in one sample, mud tube of Nereis (a marine sandworm) in one sample, a specimen of the worm itself (young) in another, and one tubificid worm.

Mud from the river channel at Popes Creek, 29 miles below Possum Point, showed one or two tubificid worms in each sample. *Gammarus*

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appeared in two samples in moderate numbers. The marine crustacean *Squilla*, and the marine worm *Nereis* were found, one each and both young, in one sample. Mud from Lower Cedar Point contained a few young mussels, one *Gammarus*, and two tubificid worms. Two or three other samples taken in the lower portion of this stretch of river contained *Gammarus*, *Squilla*, and mud tube of *Nereis*. No living plants were found except a few bits of blue-green alga in one sample from the channel at Popes Creek.

DISTRICT II.

This district, 12 miles below Colonial Beach, includes only about 2 miles of the river's length. Wicomico River, in reality a bay of considerable size, and Bretons Bay, Nomini Bay, and St. Clements Bay increase the river's area and their drainage basins contribute a small amount of fresh water. Much fishing is done in this part of the river and the oyster industry is important. No source of contamination is apparent.

Plankton.—Samples were taken in the river channel near Blackistone Island, December 17, 1913, January 13, and May 19, 1914. The winter samples showed seven genera of diatoms in one collection and the summer samples contained four genera. The most numerous in winter samples were *Stephanodiscus* (6,500 per liter) and *Asterionella* (9,000). *Pyxilla* was found here, the first time this curious diatom has appeared in the plankton thus far. *Fragilaria*, *Navicula*, *Cyclotella*, and *Synedra* appeared in small numbers. *Melosira* (8,000 standard units) was found in the summer sample.

Blue-green algæ were not found. Green algæ occurred sparingly in two samples. Neither Fungi nor Rhizopods were found. Mastigophora, or rather Dinoflagellates, were present in abundance in all collections; those in winter showing *Peridinium* (90,000 per liter), *Ceratium* (4,500), and a very few *Glenodinium*, while the summer collections showed about 4,000 of the latter per liter.

Infusoria were represented in all samples by *Codonella* in small numbers. In the May sample, *Tintinnus* was found, 5,000 per liter. The rotifers *Colurus* and *Synchaeta* were present in small numbers in the winter samples. *Cyclops* and *Acartia* of the crustaceans occurred in moderate numbers in all channel samples.

Samples taken in St. Clements Bay and in Bretons Bay yielded a plankton content essentially similar to that from the river channel. They differed chiefly in the fact that the Dinoflagellates were less abundant and the crustacea, especially *Acartia*, were more abundant, there being as many as 14,000 of the latter per liter in the sample from Bretons Bay.

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No organisms indicating contaminate conditions occur in the foregoing list, with the possible exception of a few *Tintinnidae* in one sample. Positive evidence of contamination is lacking.

Bottom samples.—Mud samples gave little evidence of a definite character. One sample contained *Nereis*, the marine "sandworm." No plant life was found. Fragments of oyster shells were moderately abundant. The mud was soft and sticky, yellowish and gray in color, with a trace of "stale" odor.

DISTRICT III.

Plankton.—This stretch of 11 miles extends to within 7 miles of the river's mouth. A branch estuary (St. Marys River) penetrates the Maryland shore for a distance of 9 miles. This body of water, over a mile wide at the mouth, provides another commodious delay station for the lower Potomac.

Three plankton samples were taken in December, 1913—three in January and one in May, 1914. The depth of the Potomac here varies from 20 feet near the shore to a maximum of about 80 feet in some parts of mid-channel. December samples taken in the edge of the channel at Ragged Point (8 miles below District II) showed 13 genera of diatoms. The most aboundant was the curious filamentous form *Chaetoceros*, of which there were about 13,000 standard units per liter; *Pleurosigma* (3,000 per liter), *Stephanodiscus* (2,600), *Asterionella* (2,500), *Navicula* (1,900), and *Cyclotella* (1,800) were the other leading genera. *Pyxilla* and *Synedra* were present in small numbers.

A small bit of blue green was found in one sample, also samples of two green algæ, one of which was evidently *Ulothrix*. *Crenothrix* appeared in one sample in small amount, *Difflugia pyriformus* (400 to the liter) was found. Of the Mastigophora the Dinoflagellate *Creatium* appeared, 1,500 to the liter. *Codonella*, of the infusoria, was present to the number of 2,700. No rotifers nor crustaceans were found in this sample.

A December sample from Sandy Point, 4 miles below Ragged Point, showed a light plankton content. This sample was taken nearer shore, in about 14 feet of water. The preceding sample at Ragged Point was taken on the edge of the channel at a depth of 27 feet.

Only four genera of diatoms were found in the Piney Point sample. *Chaetoceros*, leading, with 4,200 standard units per liter, *Asterionella* (1,800), *Stephanodiscus* (600), and *Pleurosigma* (600) were the other genera. No blue-green algæ were present. The dinoflagellates *Ceratium* (1,800 per liter) and *Peridinium* (600) were found. *Codonella*

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and the crustacean *Cyclops* appeared, 1,200 and 900 per liter, respectively. A December sample taken in 12 feet of water near St. Georges Island showed an almost identical plankton content, the same diatoms, the same dinoflagellates, and crustaceans. This point is 4 miles from Piney Point, on the same side of the river. Conditions seem to be similar at these two places, and this similarity is reflected in the plankton content.

Two samples were taken in St. Marys River in January—one at the mouth of the river and the other 6 miles up the river, near the village St. Marys. The channel at the latter place is about 18 feet deep. When the sample was taken (15 feet "vertical") the temperature of the water was 2° and the turbidity was 12. Nine genera of diatoms were present in this sample. *Asterionella* (21,000 per liter), *Eunotia* (6,000), *Melosira* (5,000), *Synedra* (3,000), *Stephanodiscus* (2,000), *Navicula* (2,000), *Pleurosigma* (2,000), with *Pyxilla* and *Nitzschia* in smaller numbers per liter, comprised the list. Blue-green algæ were absent. A fragment of the filamentous green alga *Cladophora* was found. The dinoflagellate *Ceratium* (3,000), *Glenodinium* (2,000), and *Peridinium* (1,000), the infusorian *Codonella* (3,000), also a bottle-shaped *Tintinnus* (1,000), the rotifer *Synchaeta* (1,000), and the crustacean *Cyclops* (2,000) completed the count.

A 30-foot vertical sample was taken at the river's mouth on the same day. Temperature and turbidity was the same as in preceding. *Asterionella* (21,600 per liter), *Cyclotella* (4,000), *Melosira* (3,600), *Stephanodiscus* (1,600), *Pyxilla* (1,600), *Pleurosigma* (1,200), with a few *Synedra* and *Himantidium* constituted the diatom content. A few dinoflagellates, *Ceratium* (1,200) and *Peridium* (2,400), were present, also a few *Codonella* and the bottle-shaped *Tintinnus* and a very few *Cyclops* of the crustacea.

One sample was taken in May at St. Georges Island. Temperature was 19.5°, turbidity 8. The diatom content consisted chiefly of *Melosira* (1,300 standard units per liter), *Stephanodiscus* (750), *Navicula* (750), and a few *Nitzschia*. No algæ of any kind were found. Dinoflagellates were again in evidence, showing 1,000 *Ceratium* and 1,500 *Glenodinium*. The infusorian *Tintinnus* was present (750 per liter) and crustacea *Cyclops* (1,250, mostly young) and *Acartia* (250).

The preceding plankton data in general indicate an uncontaminated water. The occasional presence of *Tintinnus*, of blue-green algæ, or of any other contaminate organism in small quantities does not signify that the water as a whole is contaminated. On the other hand, these samples show moderately large numbers of such organisms as are usually associated with water of good quality, diatoms, crustacea, and certain of the dinoflagellates. One of these related

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forms, *Ceratium hirundinella*, was found by Kofoid[1] to be abundant in Lake Michigan, but it was apparently unable to endure the polluted waters of the Chicago River and Drainage Canal in transit to the Illinois River, hence its presence in small numbers in the latter stream.

Bottom samples.—Mud samples were dark to yellow in color, with little or no odor, and were composed chiefly of soft clay. One sample was slightly granular. The sand worm *Nereis* was found in all samples. A small crustacean, similar to *Ascellus*, appeared in a sample taken off Cherryfield Point, in the St. Marys River, near the mouth. Another mud sample, taken near Priest's Point, 3 miles up the St. Marys, contained four oligochaete worms, which probably indicated some organic matter introduced locally.

Mud taken from the Potomac Channel near Sandy Point was yellowish, without odor, and contained *Nereis*, a small fragment of a grasslike Potomageton, and shreds of plant tissue. Most of the river bottom in this locality is soft, a few places only being sandy or firm.

The evidence furnished by these bottom samples tends to confirm that already secured from the plankton, to the effect that the water is not contaminated.

DISTRICT IV.

Conditions here are essentially similar to those in District III, and for all practical purposes the two sections may be treated as one. The so-called Potomac River here unites with Chesapeake Bay, after passing between Smith Point and Point Lookout.

Plankton.—Two plankton samples were collected near the edge of the channel off Point Lookout in December. The water was clear, and temperature was 8.5°. A 13-foot vertical sample showed five genera of diatoms, *Chaetoceras*, with 16,500 standard units per liter, being most numerous. *Stephanodiscus* (4,100 per liter), *Pleurosigma* (2,150), *Asterionella* (1,500), and *Melosira* (1,500) were the other genera present. Dinoflagellates, especially *Ceratium*, were fairly numerous, this organism numbering 6,000 per liter, *Glenodinium* (750), and *Peridinium* (1,100). *Codonella* and *Tintinnus*, of the infusoria, were present in small numbers. The rotifer *Synchaeta* numbered 150 per liter and *Asplanchna* about 400. No crustaceans were observed in this sample.

A December sample, taken in 32 feet of water on the Virginia side of the channel (nearly opposite Point Lookout), contained a similar plankton. *Chaetoceros* again led the diatoms with 15,000 standard units per liter. *Stephanodiscus* (4,000), *Asterionella* (3,000), with

[1] Bull. Illinois State Lab. Nat. Hist., Vol. VIII, p. 72.

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Synedra and *Pleurosigma* in small numbers were the other genera present. No blue-green algæ were found. A small amount of *Conferva* (unidentified) represented the green algæ. One dinoflagellate, *Ceratium*, was present in small amount, 500 per liter. *Codonella* (1,200), *Cyclops* (500); a few unidentified sporelike bodies, and a much contracted, unidentified organism, probably a rotifer, completed the list of plankton forms.

The plankton content at Point Lookout in May, 1914, showed considerable difference in the diatom population. The usually abundant *Chaetoceros* was absent. *Melosira* was abundant, there being over 28,000 standard units per liter. *Navicula* (10,000 per liter), *Stephanodiscus* (6,000), *Asterionella* (5,000), *Synedra* (7,000), *Pleurosigma* (3,000), and *Pyxilla* (1,000), were the other genera present. *Peridinium* (7,500 per liter), was the most abundant of the dinoflagellates. About 2,000 *Glenodinium* were also present. *Tintinnus* and *Codonella*, of the infusoria, numbered approximately 2,000 per liter each. A few *Cyclops*, chiefly young, were present, also unidentified sporelike bodies. The plankton content of these samples from District IV is, on the whole, reassuring as to the condition of the water. In no case are distinctly contaminate organisms present in such numbers as to justify suspicion. On the contrary, the prevailing organisms are those that are normally present in water of good quality.

Bottom samples.—Samples taken near the edge of the channel off Point Lookout and off Hog Island (the latter being on the Virginia side of the river) consisted chiefly of sand and gravel, the animal life of which was found to be the sandworm *Nereis*, a few oysters, and small univalve mollusks. Barnacles, sponge (a red variety), and *Bryozoa* were present in moderate numbers attached to pebbles and stones, and groups of Ascidians were found on various objects that furnished a suitable surface for attachment.

The only plant life found consisted of a few varieties of "seaweed" or marine algæ, all belonging to the group *Rhodophyceae*. No organic remains were found except oyster shells.

Five bottom samples taken by the mud scoop were examined; these were supplemented by contents of hauls made by the oyster dredge on board the Bratton. The evidence of the bottom samples, so far as observed, is in accord with the evidence furnished by the plankton, to the effect that no appreciable contamination is present.

SUMMARY.

The Potomac River consists of a narrow, rapid, "young" portion—the Upper Potomac—and a wide, slowly flowing tidal portion—the Lower Potomac. The Lower Potomac consists of a deep channel

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and extensive shallow flats, which contain much submerged plant life in summer.

The tides thoroughly mix the water of the channel and of the flats; they reverse the normal current for a time, greatly increasing the time required for water to reach a given point downstream. This has the effect of increasing the length of the river.

The sewage of Washington is pumped into the river channel 3 miles below the city. Alexandria sewage also enters the river, part of it flowing first upon a large flat. The possibility of this sewage resulting in harm to the fishing industries and oyster beds of the lower river is one reason for the present investigation to determine the ultimate fate of this sewage, and to ascertain the various related biological forces concerned in its disposal.

Weekly samples were taken at selected stations when possible. Weather conditions, ice, and extreme turbidity of water interfered with the regularity of collections.

Collecting stations were chosen with reference to existing biological factors, such as absence of sewage, presence of plant life, distance from the main sewer, influence of the flats, results of tidal movements, effects of sunlight, presence of sewage, and effects of turbidity and temperature. Samples were taken on the flats for the determination of dissolved gases. These were in addition to plankton, mud, and biological samples. Careful observation was made in the field of biological conditions prevailing from time to time. Samples of major plant life (submerged) were collected. A record of local weather conditions was kept daily, in order to note the relative effects of cloudy and sunny days and of rain and wind on the plankton organisms or on their environment.

Plankton from the channel at Three Sisters, above Washington, shows the presence, on the whole, of few organisms indicative of contamination. The occasional presence of certain contaminate forms is likely due to slight local contamination by overflow of canal water, or to flood conditions. The organisms present continuously and in greatest numbers are those characteristic of water of good quality.

The water at Giesboro Point, 5 miles below Three Sisters, has received a limited amount of polluting material from the canal, from wharves along the water front, from storm water sewers, and, occasionally, from the main sewer outlet by combined flood tide and wind. This contamination is reflected in the plankton content by the persistent presence of blue-green algæ, together with the flagellate *Euglena viridis* and certain infusoria whose normal habitat is polluted water. Bottom samples showed many tubificid worms, and a few *Chironomus* larvæ. The former organisms are usually characteristic of pollution.

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The water at Fort Foote is affected by (1) addition of sewage, (2) checking and reversing of current by tides, (3) mixing with water on flats, (4) activity of submerged plants, (5) long sedimentation and general readjustment of water on flats. Plankton samples show varied organisms consistent with the variety of factors affecting the water. The persistent presence of contaminate plants and animals attests the presence of sewage, but comparatively small numbers of these organisms indicate the effective disposal of much of the sewage. Various organisms diminish in number with the advent of cold weather, and become numerous again when warm weather returns. The character of the bottom mud, together with the contained animal life, indicates impure water.

Marshall Hall, 12 miles below the sewer outlet, is about four days below, in terms of time, because of tidal action. The water has been exposed to 16 tides and to the effluent from over 6 square miles of flats, on its 100-hour trip from the sewer outlet.

The volume of water is increased. Plankton organisms reflect this improved environment, contaminate forms being very few and pure-water forms moderately abundant. Mud samples show improvement in general character and in animal content.

A typical flat was studied to ascertain whether it constituted a benefit or an injury to the river. Some factors concerned were: (1) Presence of plankton and of mud organisms, (2) dissolved gases, (3) activity and decay of submerged plants, (4) results of tides, (5) effects of winds and sunlight, (6) fate of sewage entering a flat, (7) effects on water due to the flat as a delay station.

Hunting Creek flat was thus studied. Its area is $1\frac{3}{10}$ square miles, with a river frontage of $1\frac{1}{4}$ miles. It has a heavy growth of submerged plants. The average tide is 30 inches. A sewer discharges on the flat. It is drained by a small dredged channel and by a broad natural channel. Samples (plankton, mud, dissolved gases, and bacteria) were taken at points illustrative of (1) sewage contamination, (2) mid-flat or average conditions, (3) final condition of water as it ebbed back to the channel.

A moderate number of contaminate organisms is present in the water in the vicinity of the sewer. In mid-flat these organisms are fewer in number. At the point where the water ebbs from the flat to the river channel the contaminate organisms are again moderately abundant, probably due to tidewater from the river channel. The character and inhabitants of the bottom mud are in accord in every case with the evidence furnished by the plankton.

Many factors involved in dissolved oxygen and free CO_2 content of water also affect, directly or indirectly, plankton life. In the vicinity of the sewer on the flat dissolved oxygen is lowest and free CO_2 is highest; bacterial counts also are highest here. In mid-flat

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dissolved oxygen is higher and CO_2 lower, as a rule, than in the vicinity of the sewer. As the water ebbs from the flat it is still higher in dissolved oxygen than the water in river channel. The high dissolved oxygen of water on the flat seems to be due partly to the synthetic activity of submerged plants in the presence of sunlight and absence of turbidity, the average per cent of oxygen saturation on sunny days being 103 and on cloudy days 75.

The effect of sunlight on activity of plants on the flats is noticeable in the water of the adjacent river channel, this being higher in dissolved oxygen on sunny days than on cloudy days. This difference is not apparent at Three Sisters, where plant life is not a factor. The dissolved oxygen of ebb-tide water taken in the afternoon is higher than that of samples taken in the forenoon. This is seemingly due to a longer period of synthetic plant activity.

Tidal action, forcing large amounts of water on the flats and withdrawing it regularly, similar to the movements of air in the lungs, is largely responsible for the long period of readjustment to which much of the water is subjected.

Hunting Creek, with an area of 1.3 square miles, under conditions obtaining in October and November, produced, by biologic means, sufficient oxygen for the complete oxidation of a portion of Alexandria's sewage and of 6,000,000 gallons per day of Washington's sewage. Considering only the first 24 hours' oxidizing reaction, this flat produced oxygen sufficient to care for 30,000,000 gallons of Washington sewage daily in addition to the complete oxidation of the portion of Alexandria's sewage.

Plant life on the flats apparently decays slowly and produces little or no change in the dissolved oxygen content of the water. This may be due (1) to circulation enforced by tides, (2) to production of oxygen by activity of microscopic plants, especially diatoms and algæ. Experiments furnish evidence in accord with the latter.

In the early spring mud is disturbed on shallow flats by water agitated by wind, producing a much higher turbidity than is present in channel water at the same time. In summer and fall conditions are reversed, submerged plants protect the mud, and the turbid water of the channel does not penetrate far into the flat. Sewage discharged on the flat has nearly disappeared when water ebbs into the river channel, three-fourths of a mile away. Present data concerning this matter are insufficient.

The lower 60 miles of the Potomac have the characteristics of an estuary. Relatively few plankton samples were taken, as there was scant evidence of contamination.

In District I, 40 miles in length, the water becomes brackish, and most of the mud in suspension settles or is precipitated. Peridinium

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appears in the plankton here. The evidence of the plankton is to the effect that the water is not contaminated. Evidence furnished by mud samples is less favorable, but indicates only slight contamination.

District II is in the fishing and oyster dredging territory. Neither plankton nor mud gives evidence of contamination of water. Organisms characteristic of good water are abundant.

District III is well in the lower part of the estuary. Plankton shows many genera of diatoms, including *Chætoceros*. Contaminate organisms are absent, both from plankton and from mud.

District IV is the region at the mouth of the lower river. The deep, clear, brackish water gives no adequate evidence, in plankton or mud, that contamination is present.

CONCLUSIONS.

1. Certain organisms, both of the plankton and of the bottom mud, are prevalent in those parts of the river where sewage is discharged, but are not prevalent in the unpolluted part of the river above Washington nor in the lower estuary portion. These organisms gradually but surely disappear in proportion as time and distance increase down the river from the place where sewage enters the water. The plankton life about 50 miles below Washington indicates as good a water as that at Three Sisters.

2. The abundance of certain organisms means not only the presence of sewage, but also the disposal of much of it, because of the establishing of certain links in the various chains of food relations. Certain animal forms especially are rarely found in clean water, but are abundant in polluted water. These organisms must find in such water the food they require. Some are evidently scavengers. Others are known to be omnivorous or carnivorous, the larger preying on the smaller; but this must come to an end somewhere, else microscopic life would cease. There must be an adequate food supply for the swarms of smaller organisms that are eaten by the larger; also there must be a connecting link between the nonliving dissolved organic matter, on the one hand, and, on the other, the smallest of those organisms whose habits start the "chain of food relations." There is reason to believe that bacteria and other minute plants occupy the important position of this connecting link by utilizing the dissolved organic matter and by becoming in turn the food supply of minute organisms.

3. This possible destruction of bacteria by certain plankton organisms may help to explain the sudden decrease, at times, in the bacterial count. The activity of these larger organisms may also be a factor in the frequent discrepancy between the large amounts of organic matter disposed of and the resulting small amounts of nitrates

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finally formed by bacterial action, as some of these plankton forms apparently find much of their food in the sewage itself, instead of in sewage bacteria. We can not know the full significance of these organisms in water and mud until we have accurate and complete knowledge of their food habits.

4. Volume of plankton, irrespective of kinds of organisms composing it, does not necessarily imply presence of sewage or absence of it. Inspection of Table 28 shows that the volume of plankton at Three Sisters is less than at other stations and that the volume is greatest in the unpolluted water of the Potomac Estuary, near Chesapeake Bay. This abundance is evidently due to the gradual admixture of salt water, as some of the organisms are marine forms.

5. The effect of the time factor, together with adequate food supply, is evident in the increased plankton content at Marshall Hall, where the volume of plankton is twice as great as at Three Sisters. This increase is probably due to the delay on the flats, together with food introduced by sewage, as many of the organisms are sewage forms. The plankton at Three Sisters has neither the time factor provided by delay on the flats nor the food furnished by sewage.

6. The flats are effective as breeding places for plankton, the average volume per cubic meter of water being more than twice as great as is found in the adjacent river channel. These average volumes are shown to be 3.64 c. c. for the flats and 1.60 c. c. for the adjacent river channel.

7. In summer the flats are vast "balanced aquaria," with a surplus of dissolved oxygen. In fall and early spring they are integral parts of the river on account of tidal action. Throughout the year they are valuable delay stations for the water. As an asset to the river they are second only to the tides in importance.

8. The flats undergo a sort of annual "house-cleaning" process in the spring, when the ice goes out, carrying any accumulated débris with it. For several weeks the spring winds agitate the shallow water and stir up the surface mud. When this again settles it has been exposed to long contact with well-aerated water. The cleansed flat is now ready for another season's work as a purifying delay station.

9. Examination of plankton and mud from the Potomac Estuary shows the presence of a very few doubtful contaminate organisms and indicates that this water is in better condition, as to sewage contamination, than the average water at Three Sisters, just above Washington.

10. The character of the bottom mud does not fluctuate as widely nor as suddenly as does that of the water above it. Being more stable, it is a valuable index of the average condition of the water. It is a

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depository of evidence and a resultant of the prevailing factors that affect the water. Almost invariably the evidence of the bottom mud is in accord with that furnished by the plankton, and its study is equally important.

11. The tides, the flats, and in summer the submerged plants on the flats constitute the triumvirate of purification of Potomac water. The tides dominate the situation by producing thorough mixing of sewage and water, increasing by many times the effective length of the river and providing a very long time factor for the activity of organisms, and by compelling frequent and thorough circulation of channel water with that on the flats. The latter are thus made integral parts of the river, and they become most useful allies, instead of the semistagnant bayous they would probably be if the river were tideless.

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POTOMAC SHELLFISH.

Oysters in the lower reaches of the Potomac River form the basis of a large and important industry. Large numbers of men gain a livelihood from this source, and the product is shipped, chiefly through Washington and Baltimore, to many diverse parts of the country. In order to protect this industry, as well as to protect the ultimate consumers of the oysters, it is essential that the sanitary quality of the shellfish be known, and when necessary improved and protected.

The oyster beds extend from the mouth of the river about halfway to the city of Washington. In the upper few miles they are used almost solely for the growth of spat, and the oysters developing here are used chiefly for planting the lower beds and rarely reach marketable size.

From data on pollution and purification of the river detailed in the preceding sections it is evident that by the time the water reaches the area of the oyster beds it has undergone its maximum purification. Although during the winter months the increased stream flow shortens the time during which purifying agencies may act, any anticipated danger of pollution of shellfish from this cause will be shown to be without foundation.

The method of collecting samples of oysters and recording the specimens has already been referred to (p. 78).

Procedure followed in examination of shellfish.—The procedure used for the examination of shellfish and for scoring the results obtained was that recommended by the American Public Health Association at its meeting in 1912. The score or rating, according to this method, is calculated by adding the reciprocals of the highest dilutions in which *B. coli* has been found in the shell liquor of the five oysters which form the specimen. Thus, in the shell liquor of five oysters separately examined, *B. coli* has been found in three in the 0.1 c. c. dilution and in two in the 1 c. c. dilution. The reciprocals are 10, 10, 10, and 1, 1, and their sum is 32—the rating.

The oysters were removed from the bag, thoroughly scrubbed with tap water, which is here practically free from bacteria. They were then wiped dry, seized with rat forceps, and flamed, to eliminate all danger of contamination from without. The oyster was then carefully opened with a narrow-blade stabbing oyster knife, which had also been passed through a flame. The samples taken on the steamship *Bratton* were scrubbed at once in the water from which they were taken and then flamed and opened.

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Bacterial counts were made of a composite sample, made by mixing equal quantities of the shell liquor of each of five oysters, plated in various amounts in nutrient agar, which was incubated at 20° for three days, and then counted. The qualitative determination of the *B. coli* group was made by placing measured quantities of liquor from each of five oysters of the sample in fermentation tubes containing lactose peptone bile or broth, and, in a large proportion of the samples taken, parallel series were run in both of these media for the purpose of determining their relative values. The fermentation tubes were then incubated for three days at 37° and gas formation noted. From the highest dilution showing gas and from the lowest showing no gas, Endo plates were then inoculated for confirmatory tests. Samples of the water from over the oyster beds were taken at the same time as the oysters and analyzed in the manner previously described.

The water used for dilution purposes in the examination of oysters contained 1 per cent of sodium chloride in order to approximate the natural salinity of the oyster liquor. In addition to this, however, a number of parallel dilutions in distilled water were plated for comparison. A higher count was invariably obtained from the saline dilutions.

Samples of oysters for bacteriological examination were taken at frequent intervals during the period from November 25, 1913, to May 26, 1914 (fig. 27). Certain stations were established throughout the areas from which oysters are taken for general consumption and carefully located in order that the samples might be taken from approximately the same places on each occasion. An effort was made to secure a considerable number of examinations of oysters from all the principal oyster bars in the Potomac River throughout the season. The samples were collected by the crew of the sample boat, and the tubing and plating were done at the moment the oysters reached the laboratory, seldom more than three or four hours after being taken from the water. Samples of water at a depth of 2 feet and on the bottom were taken over the oyster beds with nearly every sample of oysters and examined at the same time with it.

RESULTS OF BACTERIOLOGICAL EXAMINATION OF OYSTERS.

General results.—The results of bacteriological examination of the oyster specimens will be found in Table 39. Attention is drawn to the low average score in general. In Table 40 the results of simultaneous examinations of oysters and the overlying water for 12 representative stations are given, these stations having been selected for making certain comparisons. It will be noted that the *B. coli* content of the oysters does not bear a constant relation to that of the water immediately

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overlying the bed. With but few exceptions, the average for the water is higher in January and February than in any other months, while in every case the oysters contain fewer colon bacilli during these months than they do in April and May. This divergence of the *B. coli* content of the water from that of the oysters coincides with the observations of Gorham and others in this respect. The seasonal variation in the *B. coli* content of the oysters is therefore independent of that in the surrounding water and to an extent opposite in direction, being more nearly correlated with the temperature. From these and other observations it has been deduced that during cold weather the functional activities of oysters become reduced, and that much less water is passed through them in a given time period. The above figures remove the apprehension lest in the period of delayed purification of the river water an increased contamination of the oysters might take place.

TABLE 39.—*Summary of the results of the analyses of oysters, arranged by stations.*

Station from which oysters were taken.	Number of samples.		Average score.		Maximum score.	
	Broth.	Bile.	Broth.	Bile.	Broth.	Bile.
Popes Creek, Md., 150 yards northwest of wharf	12	6	2.5	1	14	2
Paspahanza Creek, 150 yards offshore	10	5	3.9	.4	4	2
Lower Cedar Point	17	8	5.5	1	32	5
Piccowaxton Creek, Md	3	1	1.7	2	14	2
Cuckold Creek, Md	7	3	.1	1.3	3	3
Swan Point	15	11	6.2	.5	50	2
Swan Point Creek:						
50 yards offshore	5	1	9.8	1	41	1
500 yards offshore	0	1	.....	1	.....	1
1,000 yards offshore	1	1	0	0	0	0
Kettle Bottom, between Swan and Bluff Points	1	1	0	3	0	3
Neal Creek, off buoy 14	7	3	5.3	0	32	0
Cobb Point Bar:						
50 yards off Beacon No. 42	1	2	2	3	2	3
100 yards off Beacon No. 42	8	7	1.8	1	5	5
Wicomico River samples.						
Opposite St. Margarets Island, off mouth	9	7	1.1	1.1	3	3
Shipping Point	1	1	2	3	2	3
Bluff Point	1	1	3	1	2	1
Rock Point Bar buoy No. 6	2	1	1.5	2	2	2
Lancaster Wharf:						
50 yards off	1	0	1	0	2	0
200 yards below	1	1	1	0	1	0
Kanzalo Bar, off Bushwood	1	1	3	2	3	2
Startletts Bar, off Bushwood	1	1	3	2	3	2
Charles Point	2	1	8	.5	14	1
Key Bar	1	1	1	1	1	1
Lumps in channel (Wicomico lumps)	1	1	1	0	1	0
Roats	1	1	4	2	4	2
St. Catherine Island Sound, off Chisel Time Bar, 50 yards off dock	3	3	3.7	9	4	23
Sheepshead Bar, near red buoy 6	9	8	2	2.1	5	14
St. Clements:						
Samples off Coltons Wharf	5	3	1.8	2.3	4	3
Off mouth	2	2	20	25	40	50
Blovers Cove	2	2	25.5	26.5	50	50
Cobrums Wharf	3	2	14.3	21	41	41
Upper end of St. Clements	1	0	3	0	3	0
Higgins Point, off red buoy 2	7	3	1	1	2	3

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TABLE 39.—*Summary of the results of the analyses of oysters, arranged by stations*—Continued.

Station from which oysters were taken.	Number of samples.		Average score.		Maximum score.	
	Broth.	Bile.	Broth.	Bile.	Broth.	Bile.
Bretons Bay samples.						
Bretons Bay, mouth of	1	1	3	0	3	0
Protestant Point	3	2	1.3	1.5	2	3
Lovers Point	3	2	1.7	1.5	4	2
Piney Point	18	16	.6	.4	3	3
Off St. Georges Island	18	16	.3	.4	2	3
St. Marys River samples.						
Cherry Field Point	1	1	0	0	0	0
Priests Point	3	2	2	2.5	3	4
St. Marys, 50 yards offshore	2	2	1	1.5	2	2
Smith Creek:						
Off red beacon	2	2	.5	.5	1	1
In creek	2	2	.5	2.0	1	4
Cornfield Point, Md	16	14	.7	.4	3	2
Point Lookout, Md	14	12	1	1	4	4
Coan River, Va., samples.						
Entrance near Beacon	1	1	14	0	14	0
300 yards south of Lewisetta, near Beacon	1	1	23	5	23	5
Cowerts Wharf	2	1	1.6	0	320	0
200 yards above Walnut Point Wharf	1	1	0	23	0	23
Off Hog Island	13	11	2.9	.8	.....	.....
Yeocomico River samples.						
Off entrance, Beacon	.....	1	.....	0	.....	0
Off Mundy Point	1	1	4	0	4	0
Off Mundy Point, ½ mile	.....	1	.....	0	.....	0
Below Kinsale Wharf (Baileys)	1	.....	5	.....	5	.....
Off Kinsale Wharf	.....	1	.....	23	.....	23
Lynchs Point	11	10	.6	1	4	2
Ragged Point, off lighthouse	13	12	3.1	.7	32	3
Machodoc River, ½ mile off entrance	2	2	25	20.5	50	41
Machodoc River, off Narrow Beach	2	2	9.5	14	14	23
Kingcopsico Point, Va., 500 yards offshore	2	2	11.5	25	23	25
Nomini Creek, Va., samples.						
Above Dietricks Wharf, 200 yards	2	2	21.5	21.5	41	41
Deep Point	1	.....	23	.....	23	.....
Deep Point, 100 yards down	1	1	4	0	4	0
Nomini Cliffs, 100 yards offshore	9	9	1.2	.7	5	4
Popes Creek, Va., off Washington Monument, 25 yards from shore	13	8	5	3.75	32	2
Wakefield, 100 yards offshore, south of pier	15	10	1.5	1.4	5	4
Old Farm, 250 yards off steel pier	4	3	5.5	2.3	14	4
Haywood Breaks, between Wakefield and Church Point, 100 yards offshore	12	8	5.25	2.25	32	14
Church Point, Va	8	4	5	2	23	5
Mattox Creek, Va	10	6	6.5	1.6	32	.....
Monroe Creek, Va.:						
800 yards off	17	12	1.4	2.7	4	13
20 yards off sewage plant	8	3	11.8	1.7	50	1
Gum Bar	1	1	1	1	1	4
Colonial Beach, 500 yards off stone house	17	10	2.5	5.0	14	41
Watsons Bar, 100 yards off Watson's cottage	5	1	1	14	4	14
Off Classic Shores, southeast of Bluff Point	4	4	0	0	0	0
Bluff Point, Va	6	4	1	1.5	3	3

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TABLE 40.

WAKEFIELD, VA.

Months.	Number of samples.	Average score.	Average temperature.	Average B. coli per c. c. in water over bed.	Average agar count at 20° (oysters).	Months.	Number of samples.	Average score.	Average temperature.	Average B. coli per c. c. in water over bed.	Average agar count at 20° (oysters).
December						March	2	0.50	3	0.02	3,000
January	6	1.5	3	0.36	2,800	April	3	1.3	13.3	.05	6,000
February	1	0	3	.05	5,200	May	4	3.2	19	.04	17,600

WATSON BAR.

December						March					
January						April	4	0.5	11	0.07	13,400
February	4	0	3.2	0.17	21,200	May	2	9.0	19	.10	9,300

MONROE CREEK.

December						March					
January	1	5.0	5	1.0	27,500	April	3	3.7	13.3	0.07	63,000
Eebruary	1	2.0	5	.55		May	4	20	19	.66	104,700

COLONIAL BEACH.

December	5	1.8	8	0.14	4,200	March			3		
January	2	2.5	2.5	.30	12,800	April	3	7.0	13.3	0.22	7,300
February	3	1.0	3.7	.40	13,200	May	5	13	19	.14	12,500

SWAN POINT.

December	2	2.5	8.5	0.05	1,500	March	1	0			10,000
January	4	6.0	2.5	.27	8,500	April	3	17.0	99	0.03	6,900
February	4	1.0	2.2	.27	2,300	May	3	1.3	19	0	37,700

800 YARDS OFF MONROE BAY.

December	3	2.0	8	0.07	9,400	March	1	0	1	1.00	3,900
January	6	2.1	4	.38	11,800	April	3	1.7	13.3	.07	6,000
February	1	0	1	.05	1,900	May	5	5.0	19	.06	7,800

MATTOX CREEK.

December						March	2	2.0	2.5	0.05	8,600
January	1	5.0	5	0.55	1,000	April	3	7.0	13.3	.03	9,300
February	1	0	5	.10		May	5	6.5	19	.14	14,000

HAYWARD BREAKS.

December						March	2	0	2.5	0.03	2,400
January	1	2.0	5	0.55	22,500	April	3	8.3	13.3	.03	10,200
February	3	.33	3	.37	4,900	May	5	9.8	19	.17	71,000

LOWER POPES CREEK.

December						March	3	1.0	3	0.03	4,100
January	1	1.0	5	0.55	50,000	April	3	8.6	13	.03	17,000
February	3	1.0	4	.40	18,500	May	4	8.7	19	.02	20,000

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TABLE 40—Continued.

SHEEPSHEAD BAR.

Months.	Number of samples.	Average score.	Average temperature.	Average B. coli per c. c. in water over bed.	Average agar count at 20° (oysters).	Months.	Number of samples.	Average score.	Average temperature.	Average B. coli per c. c. in water over bed.	Average agar count at 20° (oysters).
December	3	2.3	7.7	0.07	17,000	March					
January	3	0	3	.01	2,000	April	1	4.0	14	0	9,000
February	1	0	2	0	2,200	May	3	7.3	19	0	24,500

HIGGINS POINT.

December	4	1.7	7	0	8,800	March					
January	1	0	5	0	800	April	1	1.0	14	0	6,300
February						May	2	2.5	19	.05	20,000

LOWER CEDAR POINT.

December	6	4.5	7	0.03	5,000	March					
January						April	5	1.8	12	0.12	22,800
February	3	1.3	4	.10	18,700	May	3	4.0	19	.05	12,700

General averages of above stations by months.

Month.	Number of samples.	Average score.	Temperature (°).
November	7	0.3	11.0
December	23	.6	8.0
January	26	.9	2.5
February	25	.26	3.7
March	11	.3	3.0
April	35	1.7	13.3
May	43	2.1	19.0

Samples giving high scores.—It is of interest to examine more closely the samples which gave high scores on examination. Seventeen of the 461 samples collected in the river and its tributaries gave a score of 32 or over. Of the 17 samples, 3 had a score of 41, 5 had a score of 50, and but 1 had a score of over 50. While a score of 32 was formerly regarded by some persons as the upper limit of safety, this figure has been raised to 50, and such a rating is now generally considered to be a safe one. The six samples scoring 50 or more will therefore be considered.

The sample from near the mouth of St. Clements Bay, which scored 50 in broth and 40 in bile, was taken January 29, the tide being ebb, the water 4.8°, depth of water 18 feet, salinometer reading 1.0095. The oysters of this lot, which scored 50, were kept for 96 hours on the boat and in the incubator at 15°. Other oysters of the same lot examined at once gave a total agar count of 700 and a score of 0 on both bile and broth. The samples from Cobrum's wharf, which gave a score of 41, and the one from Blovers Cove, which gave a score of 50, were also kept for 96 hours with the St. Clements Bay sample. Oysters of the same lot from Cobrum's wharf, examined immediately,

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gave a total agar count of 9,300, a score of 0 in broth, and 1 in bile. Oysters from the same lot as those from Blovers Cove when examined immediately gave an agar count of 9,300 and a score of 1 in broth and 3 in bile. Both lots were taken January 29, the tide being flood, the temperature being 6.2° and 4.5°; depths, 6 feet and 8 feet; salinometer reading, 1.012.

The flats and Blackistons Island prevent any considerable amount of water from passing from the Potomac to St. Clements Bay on an ebb tide. The pollution when present is probably due to local sources, from farms, and the few houses on the shores.

The samples from off Machodoc River, which gave a score of 50, were also kept for 96 hours, and oysters of the same lot analyzed immediately gave a score of 0 in broth and bile with an agar count of "spreader." The samples from Coan River, off Cowarts wharf, were analyzed at once. They were taken May 20, after the oyster season was over. At Lewisetta there is a large fish factory only a few hundred feet from this bed, as well as a group of several houses; the pollution was evidently local. Oysters from this immediate vicinity are certainly undesirable during the season when the factory is at work, which fortunately is not coincident with the oyster season of Virginia.

The sample taken May 15 about 20 yards off the mouth of the outfall of the Colonial Beach sewage-disposal tank, in Monroe Bay, scored only 50, probably owing to the small amount of sewage at that time of the year and the great dilution; though of nine other samples taken at that point only one scored as high as 23. While it is true that this tank, during the period from September 1 to July 1 of each year, receives such a small amount of sewage that there is little effluent, the potential danger here is too great and it is quite evident that such a bed should not be used.

The Swan Point sample, taken April 30, which gave a score of 50, and the one from Swan Point Creek, taken the same day, which gave a score of 41, were the only samples, out of the 65 taken above a line from Colonial Beach to Swan Point, which gave over 32 score; they were taken on a flood tide, with a temperature of 17°, and were probably due to local field wash. While these samples from Swan Point were taken about the time when the high freshet from the upper river would have its maximum effect in the river below Cedar Point, the bacterial results obtained from water taken over the beds showed *B. coli* absent in each of two 10 c. c. samples, and the total counts were only 40 in the top and 34 in the bottom, sample on agar, and only 240 in the top and 230 in the bottom, sample on gelatin.

One of the 18 samples taken at Lower Cedar Point cross section gave a score of 32 on a flood tide, with temperature of 21°, but no other samples scored over 5. The higher score may have been due to

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purely local pollution. The high score samples have been brought together in Table 41.

Of the 461 samples, of 10 or more oysters each, taken from the beds of the Potomac River or its tributaries, the following had scores of 32 or more, according to the method recommended by the Committee of the American Public Health Association. The score given throughout is the higher, whether from broth or bile media.

TABLE 41.—*Samples of oysters which scored 32 or more.*

Station from which taken.	Date.	Tide.	Temperature.	Score.	Media.	Total count agar at 20°.	B. coli in water over bed at time taken.
			°C.				c. c.
Potomac River:							
Lower Cedar Point	Dec. 13	Flood.	7	32	Broth	5,100	— in 10
Swan Point	Apr. 30	...do...	17	50	.....do	7,400	— in 10
Swan Point Creek	...do....	...do...	17	41	.....do	7,400	— in 10
Neal Creek, 25 yards off buoy 14.	...do....	...do...	17	32	.....do	46,000	— in 10
St. Clements Bay, off Cobrum's wharf.[1]	Jan. 29	...do...	6.2	41	Broth and bile	57,000	— in 10
St. Clements Bay, near mouth.[1]	...do.....	Ebb ..	4.8	50	Bile (broth 40)	74,000	— in 10
St. Clements Bay, Blover's Cove.[1]	...do.....	Flood.	4.5	50	Broth and bile	600,000	— in 10
Coan River, off Cowart's wharf.	May 20	...do...	.....	320	Broth	1,200	— in 10
Do	Mar. 10	Ebb ..	3.5	32	.....do	6,400	— in 10
Coan River, off Hog Island	Mar. 11	Flood.	2.8	32	Broth (bile=5)	16,000	— in 10
Ragged Point Light	...do.....	...do...	2	32	Broth (bile=3)	8,100	+ in 10
Nomini River, between Dietrick's wharf and Mount Holly.[1]	Jan. 29	...do...	6.5	41	Broth and bile	42,500	— in 10
Machodoc River, one-half mile of entrance.[1]	...do.....	Ebb ..	5.4	50	Broth (bile=41)	8,600	— in 10
Popes Creek, Va.	May 15	...do...	19	32	.....do	40,000	— in 10
Haywood Breaks, Va.	...do.....	...do...	19	32	.....do	30,000	— in 10
Mattox Creek, Va. (private bed).	...do.....	...do...	19	32	.....do	24,500	— in 10
Monroe Creek, 20 yards off sewage-disposal plant outfall.	...do.....	...do...	19	50	.....do	100,000	+ in 10

[1] The samples kept 72 hours or more in incubator at 15° before being analyzed.

Pollution from excreta of men taking oysters from beds.—In no case, therefore, was any evidence discovered tending to show that high scores in oysters were due to contamination of the river water introduced at any point above the oyster-bearing area. Since there are at times several hundred men in boats over the beds engaged in taking oysters the possibility of contamination of the latter by excreta discharged into the stream must be considered. In Table 42 the number of men and boats occupied in dredging oysters according to accurate observations carried out during the investigation is given, and in Table 25 these numbers, expressed in daily averages, are compared with the colon bacillus content of the water for the same periods. No correlation is apparent, and the higher *B. coli* counts for January and February have already been amply accounted for by the increased stream flow and shortening of the time allowed for purification. The volume of water at these points is so great and the pollution added so scattered that dangerous contamina-

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tion of this source can safely be eliminated. It is believed also that very little pollution is added to the stream over the beds in the main river, since it is customary for the oystermen to attend to these matters after retiring to the inlets and tributaries, which they do at night for the safety of their boats.

TABLE 42.—*Approximate number of vessels and men engaged in dredging oysters on the lower Potomac River from Nov. 1, 1913, to Mar. 15, 1914, inclusive.*

STATIONS AND VESSELS.

Date.	Swan Point.	Cobb Bar.	Wicomico.	Sheepshead.	Higgins Point.	Heron Island.	Lower Cedar Point.	Chisel Time.	Nomini Cliffs.	Coltons.	Total number of vessels.	Total number of men.	Remarks.
Nov. 3	15	....	....	.....	....	....	....	....	....	....	15	75	
4	....	16	10	12	4	9	....	....	....	24	75	316	
5	....	....	....	.....	....	....	....	....	....	....	.....	.....	No boats in vicinity of cruise.
6	16	3	20	.....	18	24	....	....	....	21	102	529	
7	10	....	....	.....	....	....	....	....	....	....	10	50	
8	....	7	16	16	....	....	....	....	....	....	39	234	
10	....	....	....	.....	....	....	....	....	....	....	.....	.....	Do.
11	....	....	....	.....	....	....	....	....	....	....	.....	.....	Do.
12	....	30	....	40	8	30	....	4	....	....	112	726	
13	....	....	....	.....	....	....	....	....	....	....	.....	.....	Do.
14	....	37	10	26	9	9	....	....	....	....	91	464	
15	....	30	....	75	17	....	....	20	....	....	142	328	
17	24	....	....	.....	....	....	....	....	....	....	24	192	
18	....	30	10	30	10	9	....	20	....	....	109	522	
19	20	....	....	.....	....	....	10	....	....	....	30	220	
20	....	8	4	52	30	4	....	10	9	....	117	698	
21	....	....	....	.....	....	....	....	....	....	....	.....	.....	Do.
22	10	10	....	100	4	10	....	....	....	....	134	967	
24	....	....	....	.....	....	....	....	....	....	....	.....	.....	Do.
25	30	15	....	30	5	10	....	....	....	....	90	585	
26	....	....	....	.....	....	....	....	....	....	....	.....	.....	Do.
28	30	40	5	.....	8	5	....	....	....	....	93	674	
29	25	....	....	.....	....	....	....	....	....	....	25	150	
Total	....	....	....	.....	....	....	....	....	....	....	1,208	6,430	

Date.	Swan Point.	Cobb Bar.	Wicomico.	Sheepshead.	Higgins Point.	Colonial Beach.	Heron Island.	Lower Cedar Point.	Chisel Time Bar.	Nomini Cliffs.	Total number of vessels.	Total number of men.	Remarks.
Dec. 1	30	30	10	40	20	12	....	....	....	....	142	918	
2	25	....	....	.....	....	....	....	20	....	....	45	220	
3	....	....	....	.....	....	....	....	....	....	....	.....	.....	No trips made on the following days: 5th, 7th, 11th, and 14th.
4	35	....	....	40	....	....	....	60	....	....	135	700	
5	20	30	5	35	10	6	10	....	5	9	130	700	
6	15	....	....	.....	....	12	....	20	....	....	47	160	
10	5	....	....	.....	....	2	....	....	....	....	7	40	8th and 9th very rough.
12	20	10	10	40	10	3	9	....	10	15	127	600	
13	35	....	....	.....	....	....	....	....	....	....	35	160	
15	50	12	3	10	....	5	....	....	....	....	80	520	No oyster boats could be seen.
16	25	....	....	.....	....	5	....	14	....	....	44	260	
17	....	....	....	.....	....	....	....	....	....	20	20	160	
18	15	10	5	20	....	....	....	....	3	4	57	350	
19	30	....	....	.....	....	....	....	24	....	....	54	320	
20	20	....	....	.....	....	5	....	10	....	....	35	210	
29	28	....	....	.....	....	8	....	11	....	....	47	265	
30	20	15	10	10	....	5	....	....	3	3	66	385	
31	15	....	....	.....	....	8	....	10	....	....	33	165	
Total	....	....	....	.....	....	....	....	....	....	....	1,104	6,133	

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TABLE 42.—*Approximate number of vessels and men engaged in dredging oysters on the lower Potomac River, etc.*—Continued.

STATIONS AND VESSELS—Continued.

Date.	Swan Point.	Cobb Bar.	Wicomico.	Sheepshead.	Higgins Point.	Colonial Beach.	Lower Cedar Point.	Nomini Cliffs.	Old Farm.	Bluff Point.	Lower Pope Creek.	Haywood Breaks.	Total number of vessels.	Total number of men.	Remarks.
Jan. 2	15	10	5	....	....	10	....	3	5	....	3	3	54	300	1st, 3d, 4th, 5th,
6	15	....	....	....	....	....	20	....	....	5	....	....	40	240	9th, 10th, 11th,
7	10	5	3	10	2	8	....	5	8	....	5	5	61	350	13th, 14th, 18th,
8	25	....	....	....	....	....	18	....	....	10	....	....	53	300	23d, 24th, 25th, 29th, no trips.
12	3	....	....	....	....	....	....	....	2	....	....	....	5	25	Very rough.
15	10	3	8	3	1	....	....	6	10	....	6	12	59	300	
16	25	8	10	5	....	10	....	8	12	....	3	1	82	420	
17	....	....	....	....	....	....	6	....	....	....	....	....	6	42	
19	10	2	5	2	....	6	....	5	12	....	3	5	50	275	
20	12	5	....	....	3	1	....	....	....	....	....	....	21	100	
21	....	....	....	....	....	....	12	....	....	7	....	....	19	110	
22	18	7	3	....	....	3	....	3	14	....	6	1	55	320	
26	15	....	....	....	....	....	12	....	....	3	....	....	30	180	
27	8	3	1	6	1	1	....	6	12	....	3	2	43	240	
28	8	....	....	....	....	....	18	....	....	....	....	....	26	140	
30	15	....	....	....	....	....	....	....	11	....	14	5	45	250	
31	....	....	....	....	....	....	....	....	8	....	....	....	8	50	Do.
Total	....	....	....	....	....	....	....	....	....	....	....	....	657	3,642	

Date.	Swan Point.	Cobb Bar.	Wicomico.	Colonial Beach.	Lower Cedar Point.	Nomini Cliffs.	Wakefield.	Old Farm.	Bluff Point.	Lower Pope Creek.	Haywood Breaks.	Off Neal Creek.	Off Cuckold Creek.	Off Monroe Bay.	Church Point.	Total number of vessels.	Total number of men.	Remarks.
Feb. 2	12	8	1	5	....	3	5	7	....	3	3	....	....	....	2	49	275	1st, 4th, 5th, 8th,
3	6	....	....	....	....	....	7	8	....	6	4	....	....	....	3	34	200	12th, 13th, 14th,
6	5	....	....	5	....	5	3	1	....	3	2	....	....	....	1	25	150	15th, 22d, 24th,
7	8	....	....	3	12	....	....	....	9	....	....	....	....	....	....	32	160	25th, 26th, 27th,
9	22	3	1	1	....	6	2	6	....	3	1	....	....	....	1	46	265	28th no trips.
10	14	3	....	....	....	....	1	....	....	2	1	....	....	....	1	22	110	
11	12	....	....	5	3	....	....	....	....	....	....	....	....	....	....	20	120	
16	1	....	....	....	....	....	....	2	....	4	....	....	....	....	1	8	64	Very cold and rough.
17	....	....	....	....	....	....	....	....	3	....	....	5	3	2	....	13	78	
18	....	....	....	6	....	....	....	....	2	3	1	....	....	....	1	13	108	
19	12	3	1	5	....	....	....	3	....	2	3	....	....	....	4	33	190	
21	3	....	....	2	4	....	....	....	....	....	....	....	....	....	....	9	72	
23	10	....	....	....	....	....	....	....	....	....	....	6	4	....	....	20	120	Do.
Total	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	329	1,912	

Date.	Swan Point.	Cobb Bar.	Colonial Beach.	Lower Cedar Point.	Nomini Cliffs.	Wakefield.	Old Farm.	Lower Pope Creek.	Haywood Breaks.	Church Point.	Gum Bar.	Total number of vessels.	Total number of men.	Remarks.
Mar. 5	3	1	....	....	2	....	....	....	....	....	2	8	64	No trips made on the following days: 1st, 2d, 3d, 4th, 8th, 10th, and 15th.
6	8	....	1	2	....	....	....	....	....	....	....	11	80	
7	6	....	....	....	....	4	2	4	1	3	2	22	154	
9	3	....	....	8	....	....	....	....	....	....	1	12	84	
11	3	1	....	....	....	....	1	....	....	1	....	5	40	
12	3	....	....	12	....	....	....	....	....	....	5	20	160	
13	8	1	3	....	4	1	2	1	3	1	2	26	182	
14	10	2	4	....	....	1	5	2	....	....	6	30	240	
Total	....	....	....	....	....	....	....	....	....	....	....	134	1,004	

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TABLE 43.

Month.	Daily average of number of vessels engaged in dredging.	Daily average of number of men engaged in dredging.	Monthly averages of B. coli in these waters (per c. c.).
1913.			
August	None.	None.	0.01
September	None.	None.	.03
October	None.	None.	.03
November	110	585	.03
December	65	300	.02
January	38	214	.10
February	25	147	.14
March	17	125	.04
April	None.	None.	.04
May	None.	None.	.07

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STREAM FLOW AND TIDAL INFLUENCES IN THE LOWER RIVER.

In carrying out the studies of the natural purification of streams it was found essential to secure data concerning various hydrographic particulars. Request was therefore made to the United States Coast and Geodetic Survey for the assignment of a force to carry on hydrographic studies. The survey placed Mr. Homer P. Ritter in charge of this field work.

Inasmuch as that purification which takes place in the lower portion of the river is under present conditions of the most practical significance, the hydrographic studies were concentrated in that area to a large extent. Consecutive work of this character is extremely difficult of prosecution, since it is liable to interruption by storms, floating ice, etc., and is, at best, tedious and time consuming. This work is therefore incomplete as yet, although the data already collected have been of the greatest assistance to the investigators of the sanitary problems.

The limitations of the present report and the delay in receiving the records preclude the publishing herein of the carefully secured and valuable data as to temperatures at varying depths, salinometer readings, turbidity, and other matters of interest investigated by the Coast and Geodetic Survey. It is understood that the investigation of hydrographic conditions on the Potomac will be continued by the survey, and it is hoped a report giving all of the details will be published. Mr. Ritter has furnished complete field notes of the results of the work of his party, including all observations upon 59 float tests made during the course of the investigation. He has furnished carefully plotted charts showing the paths, times, direction, and velocity of the float during each observation; but, if reduced to the dimensions practicable in this report, these charts could not easily be interpreted, owing to the many intricate meanderings of the floats in the important tests. Charts N, O, P, Q, and R have therefore been prepared, showing the distance and direction traveled, velocity, and net gain of each test.

The many float observations which extended over only one or two tides are of value, chiefly because they offer an explanation of the varying numbers of *B. coli* found at different stations. The observations, which covered periods of several tides and often several days,

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show the net gain downstream during such periods under the prevailing conditions of tide, wind, and stream flow.

Unfortunately such a small number of observations have been made in the extreme lower portion of the river that it is impossible to make, from the float data furnished, any accurate calculation as to the time which would be occupied by sewage in traveling from Washington to the Popes Creek or Lower Cedar Point cross sections under all conditions.

The observations of the float, started April 27 during the heavy freshet, and of the advance of the turbidity line during the same time, is of great interest in showing the minimum time occupied by suspended matter in traveling from the Washington sewer outlet to Stump Neck, under great and long-continued freshet conditions in the upper river. It is most unfortunate that the float was not allowed to continue under observation, for the probable minimum time interval could thus have been approximated. It must, however, be remembered that at Stump Neck and Possum Point the influence of the flood or increasing tide with its sea water becomes potent, and the total content of that section or prism of the river is so great that even great stream flows have a comparatively small displacement capacity. It is believed that under such unusual conditions as existed at that time some of the water from the upper river would probably reach the section about Popes Creek and below in a few days, but the results of the bacterial examinations of shellfish and water do not show that dangerous conditions existed.

The observations of floats have been numerous enough to show the approximate time, under ordinary conditions, from the upper river to Maryland Point; but so far they have not been such as to show the total time required by suspended matter in being transported from the Washington sewer outlets to the shellfish beds under conditions of greatest stream flow. The latter is the practical sanitary problem, and, for the present at least, dependence must be placed upon the results obtained from laboratory analyses of water and shellfish taken throughout the year. The results of such analyses show no pollution in the shellfish which could reasonably be attributed to sewage from the upper river, nor from Washington, and, in fact, as stated elsewhere, no samples of oysters from the Potomac River itself were found to be dangerously polluted from any source.

Mr. Ritter's report on the hydrographic studies carried on thus far follows as a separate section.

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HYDROGRAPHIC DATA.

By HOMER P. RITTER, *Assistant, United States Coast and Geodetic Survey.*

CURRENT WORK ON THE POTOMAC RIVER.

Instructions.—Instructions from the Superintendent of the Coast and Geodetic Survey, dated June 16, 1913, directed me to take charge of the current work on the Potomac River, requested by the United States Public Health Service, and after a consultation with the authorities of the United States Public Health Service as to the objects that the work is to subserve, to organize a party and proceed with the work. In accordance with the above I called at the office of the Surgeon General and was directed to confer with Dr. Hugh S. Cumming, as he was in immediate charge of the investigations being made by them.

Information requested.—On the 17th I called on Dr. Cumming at the Hygienic Laboratory and was informed that the data desired by them from the Coast and Geodetic Survey were such as would have a bearing on the question of "to what extent the tides affect and how far the currents carry the sewage from this vicinity toward the oyster beds in the lower Potomac and the amount of dilution the waters of the river undergo from the fresh-water streams or influx of salt water from Chesapeake Bay," etc.

Equipment.—The 40-foot Coast and Geodetic Survey launch *Inspector*, which was then undergoing repairs and being overhauled at Baltimore, Md., was assigned to aid in carrying on the work.

Pending the arrival of the launch preparations for the Potomac River work began by installing a self-registering tide gauge at Alexandria, Va. The tidal observations began on July 1, 1913. On July 31 the launch arrived from Baltimore, Md., and on August 4 the current observations were started and were continued at various times when weather conditions permitted until October 23, 1914.

Party.—From August, 1913, to April, 1914, the party consisted of myself and from five to six "hands." Subsequently to May, 1914, the personnel of the party was increased to nine "hands." From September to April a Coast and Geodetic Survey aid was assigned to the party—Mr. W. D. Sutcliffe, from September 12 to March 28 and again from April 17 to April 29; Mr. M. E. Levy from April 2 to April 16.

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Floating plant.—In addition to the 40-foot gasoline launch *Inspector*, two 18-foot flat-bottom rowboats were used in getting about and following the current floats. During the continuous day and night float observations, which began in May, a small motor boat belonging to one of the "hands" was also used. The two launches furnished the sleeping and living accommodation during these series of observations.

Scope.—The current work had in view the determination, by means of floats, of the actual current paths in various parts of the river, especially with reference to the movement of the water in the vicinity of the Washington sewer outlet (1½ miles south of the junction of the Georgetown, Washington, and Anacostia Channels) and to ascertain the rate and extent of the probable downstream movement of the sewage discharge.

Method.—In general, the method pursued in making the float observations was to follow the float with a rowboat, in which were two observers with sextants and a boatman, the launch, manned by an engineer, steersman, and deck hand, being employed to convey the observers, boat, and float to the starting point and standing by until the close of the observations. When beginning a series of observations the float was set adrift, the time noted, and two sextant angles taken by the two observers in the boat to three fixed and located points on shore or located buoys in the river. At the same time the boatman took a sounding.

At frequent intervals the boat was rowed close to the float and its position again determined. These observations, together with the state of the weather, condition of the water's surface, direction and force of the wind, direction of current, etc., were recorded and constitute the field record. Whenever practicable the observations were started a short time before the beginning of an ebb or flood currrent and continued throughout that tide. At first all the float observations were made during daylight hours. Later on, at the end of the day's observations, the float was left to run unattended during the night, and if found still floating on the following morning the observations were continued. But as this method did not prove very satisfactory the party was increased in size, divided into three eight-hour shifts, and the float followed continuously day and night, until the observations had to be discontinued on account of stormy weather—generally not until the float and sometimes the boat had been blown on shore or into shallow water. Since May 11, 1914, continuous float observations lasting from two to five days were thus obtained.

During the night observations the float path was located by noting the time when passing buoys, wharves, lighthouses, beacons, and other located objects, estimating the distance out into the channel and taking soundings at the time. On account of the narrowness of the

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channel, the numerous buoys, and other marks in the stretch of river so far surveyed, frequent positions of the float were obtained during the night.

Floats.—At the beginning the current observations were made with a current pole 15 feet long, weighted so as to float a foot and a half out of water. The diameter of this float was 3 inches, and it weighed 38 pounds.

From May 7, 1914, the float used was an exact copy of the float used in 1913 by the Metropolitan Sewerage Commission of New York, and, as described in their preliminary report of October, 1913, consisted of a piece of 4 by 4 inch timber, 6 feet long, around the upper end of which was built the float proper, a block of wood 12 by 12 by 24 inches. On the lower end of the stem were 4 vanes 21 inches by 18 inches, placed at right angles with one another and made of No. 14 gauge sheet iron.

A $\frac{3}{8}$-inch rod, for carrying a flag by day or lanterns by night, projected about $3\frac{1}{2}$ feet above the top of the float; it was supported at its middle point by a frame of four $\frac{1}{8}$ by 2 inch flat bars. At the top of this frame were placed two 3-inch rings, for convenience in catching the float when removing it from the water. This pattern of float was found to work admirably. When in the water the float was submerged, so that the top was about even with the surface of the water. The float weighs 145 pounds. From April 2 to May 7 the float used in the river south of the southern end of the Georgetown Channel was a piece of Georgia pine, 9 feet long, submerged 7 feet, with a 30-pound iron weight attached to the bottom, giving an additional foot under water. From January 6, 1914, to May 2, when taking the float observations between Chain Bridge and Aqueduct Bridge, a 4-foot pole float, submerged 3 feet, was used. This float was 3 inches in diameter.

Summary of current work and localities occupied.—From August 4, 1913, to October 23, 1914, 109 series of current observations, extending from a few hours to over five days each, were made, on 158 days. The number of miles traveled by the floats was 1,124; number of current path positions determined, 3,189.

The places from which the float observations were started at various times during the season were: Chain Bridge; Aqueduct Bridge; Georgetown sewer outlet; Georgetown Channel; Anacostia River; south end Anacostia River; Washington sewer outlet; Alexandria, Va.; Jones Point Light, Va.; Fort Foote, Md.; Riverview wharf, Md.; Marshall Hall, Md.; Indianhead, Md.; Possum Point, Va.; Maryland Point Lighthouse; Upper Cedar Point, Md.; Popes Creek, Md.; Upper Machodoc Creek to Colonial Beach.

Compilation of the data.—The method pursued in the reduction and compilation of the data obtained in the field consists in plotting,

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on a Coast and Geodetic Survey chart, the actual path taken by the float during each series of observations, and compiling for each series a table giving a synopsis of the observations with reference to the direction and changes in direction of the tidal current, time run, and distance traveled, together with wind and weather conditions. Fifty-nine of the series of observations have been plotted and the 59 corresponding tables compiled.

OBSERVATIONS ON SPECIFIC GRAVITY, TEMPERATURE, TURBIDITY, ETC.

In addition to the current work, observations bearing on the physical condition of the river were taken at various times and places. They consisted of specific gravity determinations, water and air temperatures, color, turbidity, ice, wind, and weather conditions.

The 45 localities at which observations of the above kind were taken are distributed along the river from Chain Bridge to Point Lookout, where the Potomac empties into Chesapeake Bay. They were taken at various times between August 6, 1913, and December 31, 1914. Turbidity observations, which consisted principally in noting the color of the water, were made on 356 days and comprised 2,687 determinations. Specific gravity observations were made on 112 days and 2,485 observations taken. Temperatures of water and air, 280 days, with 3,207 water and 1,616 air determinations.

The specific gravity determinations were made with a field hydrometer, the observations being taken at 2 feet below the surface, mid-depth, and 2 feet from the bottom, and consisted of hydrometer readings, together with temperature of water at each depth and the temperature of the air, etc., at each station.

Whenever practicable, the stations were occupied in a series covering the river between Aqueduct Bridge and Alexandria on one day, followed the next day by a series extending from Alexandria to Indianhead, or vice versa. On and after June 16, 1914, the observations were extended as far as Point Lookout to the southward and Chain Bridge to the northward.

The localities at which observations on specific gravity, temperature, turbidity, etc., were made were as follows:

1. Chain Bridge.
2. Aqueduct Bridge.
3. Georgetown sewer outlet, District of Columbia.
4. Highway Bridge, Georgetown Channel.
5. South end Georgetown Channel, black buoy No. 1.
6. Benning Road Bridge.
7. Anacostia Bridge, Anacostia River.
8. Washington sewer outlet, District of Columbia.
9. Alexandria, Va. (Macalester wharf).

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10. Fort Foote, Md.
11. Riverview, Md.
12. Fort Washington, Md.
13. Black buoy 45 C, Mount Vernon, Va.
14. Marshall Hall, Md.
15. Red buoy 56.
16. Black buoy 43, three-fourths mile northeast of Craney Island.
17. Indianhead, Md.
18. Black buoy 37, off Mattawoman Creek.
19. Stump Neck wharf.
20. Beacon white light red buoy No. 52.
21. Black buoy No. 33.
22. Liverpool Point.
23. Black buoy No. 31.
24. Red buoy No. 46.
25. Red buoy No. 42.
26. Beacon red buoy No. 36.
27. Maryland Point Lighthouse.
28. Red buoy No. 28.
29. Metomkin Point light.
30. Black buoy No. 19.
31. Upper Cedar Point Lighthouse.
32. Mathias Point Lighthouse.
33. Persimmon Point beacon red light.
34. Lower Cedar Point Lighthouse.
35. Black buoy No. 13.
36. Bluff Point light.
37. Colonial Beach (black buoy F).
38. Black and white buoy B.
39. Cobbs Point lighthouse (buoy No. 9a).
40. Blackistone Island (red nun buoy No. 4a).
41. Nomini wharf.
42. Ragged Point Lighthouse.
43. Piney Point Lighthouse.
44. Travis Point (beacon light buoy No. 5).
45. Point Lookout (red nun buoy No. 2).

TIDAL OBSERVATIONS.

Alexandria, Va.—A Coast and Geodetic Survey automatic tide gauge, which records a continuous record of the height of tide, was installed at Alexandria, Va., during the last week in June, 1913. Observations began on July 1 and are still underway. The recording apparatus and float well are located in the southwestern corner of the warehouse on the wharf just south of King Street.

In accordance with the practice of the survey, the zero of the gauge and auxiliary tide staff was connected by levels with three bench marks, to permit resetting in case of accident or reestablishing the gauge at some future time. The record was removed from the recording apparatus about once a month and forwarded to the Coast and Geodetic Survey Office at Washington.

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Chain Bridge and Benning Road Bridge.—The stage of the Potomac River at Chain Bridge and that of the Anacostia at Benning Road Bridge were frequently determined by tide-staff readings made in connection with current work near those localities and at other times when an observer could be spared from the party for that purpose. Observations in this manner have been taken at Chain Bridge since December 26, 1913, and at Benning Road Bridge since January 16, 1914.

NOTES FROM THE FLOAT OBSERVATIONS.

CHAIN BRIDGE.

May 28, 1914, a float, started at Chain Bridge, after 31.35 hours reached a point 0.9 of a mile south of the sewer outlet, a distance of 10.34 miles—a rate of 0.29 of a mile an hour, or 6.96 miles a day. The observation for one complete cycle of tide, 12 hours, 24 minutes, shows an excess of 2.6 miles ebb.

August 10, 1914, 10.36 a. m.; a float started at the Chain Bridge and observed until August 15, 2.41 p. m., showed in 18 complete tides a net downstream gain of 10.8 miles in 97 hours, 29 minutes; 0.109 of a mile an hour, or 2.61 miles a day, having in the mean time traveled 39.2 miles during 57 hours, 20 minutes ebb tide, and 15.1 miles during 40 hours 9 minutes flood tide.

GEORGETOWN.

November 1: A float from Aqueduct Bridge showed ebb velocity of 0.55 mile an hour.

September 18: A float from Georgetown sewer showed ebb velocity of 0.18 mile an hour.

October 16: A float from Georgetown sewer showed ebb velocity of 0.27 mile an hour.

October —: A float from Georgetown sewer showed ebb velocity of 0.4 mile an hour.

September 3: A float started at the south end of Anacostia River reached Washington sewer outlet, a distance of 2.1 miles, in 5 hours 12 minutes—a rate of 0.4 mile an hour. The total ebb tide showing a distance of 2.3 miles, or 0.38 mile an hour.

November 5: A float in the mouth of Anacostia River showed a velocity of only 0.7 mile an hour.

WASHINGTON SEWER OUTLET.

Float observations in the vicinity of the Washington sewer outlet showed the following results:

August 20: In a complete ebb tide a float traveled from the Washington sewer outlet to Jones Point (2.9 miles) in 5 hours 30 minutes—an average time for the entire tide of 0.5 mile per hour.

August 25: In a complete flood tide a float traveled in 4 hours, 50 minutes, 1.8 miles, or an average of 0.37 mile an hour.

August 27: Complete flood tide, a float traveled 2.1 miles north of Washington sewer outlet and then turned back, 4 hours 59 minutes—0.4 mile an hour. Time of complete flood, 5 hours 22 minutes—0.5 mile an hour.

September 2: Complete ebb tide, 5 hours 40 minutes, traveled 4.7 miles—0.8 mile an hour.

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Float passed Fort Foote, 4.3 miles from Washington sewer outlet, in 4 hours 2 minutes—1.1 miles an hour.

September 11: Three hours and fifty-five minutes of flood tide carried a float 1.9 miles north of the outlet.

September 13: Part of ebb tide, a float started at the outlet traveled 2.5 miles in 5 hours 1 minute—0.5 mile an hour.

It was noted that the current ran upstream about 1 hour on the Virginia side before turning on the Maryland side.

September 17: Float started abreast of the outlet passed Fort Foote in 4 hours 34 minutes—0.93 mile an hour. Entire tide, 6 hours 51 minutes—5.8 miles, or at a rate of 0.85 mile an hour.

September 23: A float started from an outlet showed, during 3 hours 48 minutes of flood, 1.5 miles, or 0.4 mile an hour; 3 hours 57 minutes of ebb, 2.0 miles or 0.5 mile an hour.

September 25: A complete flood tide, 6 hours 37 minutes carried a float 2.6 miles—0.4 mile an hour.

September 27: Float started abreast of sewer outlet showed velocity of 0.8 mile—2.2 miles (abreast Alexandria).

September 29: Float started abreast Washington sewer outlet on an ebb tide passed Fort Foote (4.3 miles) in 3 hours 32 minutes—1.2 miles an hour; the total time observed being 4 hours 49 minutes—4.8 miles, or 1 mile an hour.

October 1: Part of ebb tide approximated 1 mile an hour, Washington sewer outlet to Fort Foote, 4 hours 56 minutes—0.9 mile an hour.

October 2: Part of ebb tide, 5 hours, 4.1 miles—0.8 mile an hour.

October 6: Part of flood tide, 3 hours 45 minutes—2 miles, or 0.53 mile an hour.

October 11: A float started from Washington sewer outlet showed an ebb tide rate of 0.7 mile an hour, traveling 2.3 miles to abreast of Alexandria in 3 hours, 42 minutes.

October 17: One complete ebb tide carried a float from Washington sewer outlet down 6.5 miles in 6 hours 28 minutes—1 mile an hour—and, from the outlet, 4.3 miles, to Fort Foote in 3 hours 30 minutes, or 1.40 miles an hour.

October 30: Part of ebb tide carried float from Washington sewer outlet during 3 hours 26 minutes, 4.3 miles, to Fort Foote—1.3 miles an hour—and in 3 hours 48 minutes traveled 4.8 miles—1.3 miles an hour.

November 3: Part of ebb tide carried float in 2 hours 22 minutes 2 miles—0.8 mile an hour—and from the turn of tide to end—0.7 mile an hour.

April 6, 1914: Four hours eight minutes of flood tide carried float 1.9 miles, or at a mean velocity of 0.46 mile an hour.

April 7: A float started abreast the sewer outlet at the turn from ebb to flood, was left to float all night and found afloat in the channel about Macalaster Wharf, Alexandria, Va.

April 8, 1914: Left to drift all night was found aground south of Fort Foote 9 a. m. In 23 hours 48 minutes the float worked down the river 4.8 miles—0.2 mile an hour.

April 13: Started abreast of outlet, reached Fort Foote in 3.04: 1.4 miles an hour. Left to run all night, was found aground abreast of Fort Washington, 8.3 miles from outlet—a minimum velocity of 1.4 miles an hour.

April 16: Part of flood and part of ebb tide. A float started at Washington sewer outlet, during 2 hours 28 minutes of flood tide, traveled upstream 0.9 mile—0.36 mile an hour. Left adrift, was found abreast of Alexandria; 2 hours 42 minutes of ebb tide traveled 0.8 mile—velocity of 0.3 mile an hour.

April 17: Started abreast Washington sewer outlet at 9.20 April 17 and left to float all night. Found, 11.16 a. m. the following day, afloat a short distance below B buoy 43, 13.7 miles below Washington sewer outlet, traveling north.

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One flood tide and one continuous 22 hours' ebb. Flood tide in 1 hour 45 minutes—0.2 mile, or 0.11 mile an hour. During the 22 hours from April 17 to 10 a. m. April 18 the float probably traveled to Glymont, 18.7 miles south of outlet before turning—0.85 mile an hour. The current turned north between Marshall Hall and buoy 56 at 10.17, April 18. As the current probably did not travel more than 0.4 mile north after 13 hours 57 minutes, the net result was about 15 miles from Washington sewer outlet; 26 hours 40 minutes, 15 miles—0.5 mile an hour.

April 22, 23, 24: A float was started April 22, 8.37 a m., from abreast the outlet and left to drift all night of April 22, and again left to drift all night of April 23, and found 10.39 a. m. April 24, aground abreast red buoy 56. In the stretch of river from 1.2 miles south of Fort Foote to 1.6 miles south of Marshall Hall (8.3 miles) the float traveled continuously, during two flood and two ebb tides, 25 hours 9 minutes, at the end of which time the float was 8.3 miles farther down the river, an excess of ebb over flood of 8.3 miles—0.33 mile an hour.

Float started at Washington sewer outlet, 8.37 a. m., reached Fort Foote in 3 hours 37 minutes—4.3 miles, or 1.2 miles per hour; end of ebb tide 5 hours 15 minutes, 5.5 miles, 1.52 p. m.—1.05 miles per hour.

Float started at Fort Washington April 23, 2 p. m., reached Marshall Hall, 3.9 miles, in 2 hours 48 minutes—1.4 miles an hour; end of ebb tide 5.2 miles, 5 hours 47 minutes—0.9 mile an hour.

April 27 to 28, 1914: There was a heavy freshet in the river, causing a rise of 9.5 feet at Chain Bridge. From April 27, 8.55 a. m., until April 30, 4.45 a. m., 68 hours, the current was constantly downstream at Alexandria. The following, therefore, showed conditions during a heavy stream flow: A float started abreast the Washington sewer outlet April 27, 8.45 a. m., at the beginning of ebb tide, reached Fort Foote (4.3 miles) in 3 hours 0.02 minutes; Fort Washington (8.3 miles) in 5 hours 0.09 minutes. Left alone to drift all night, the float was reported at Stump Neck (26 miles) at 6.30 a. m. April 28, or 21 hours 45 minutes after the start. From Washington sewer outlet to Fort Foote the current rate was 1.42 miles an hour. From Washington sewer outlet to Fort Washington the current rate was 1.61 miles an hour. From Washington sewer outlet to Stump Neck the current rate was 1.20 miles an hour. From Fort Foote to Fort Washington the current rate was 1.90 miles an hour. From Fort Washington to Stump Neck the current rate was 1.07 miles an hour.

April 27, 3 p. m., the front edge of a freshet of dark-red water from the Potomac River appeared abreast of Riverview, and at 1 p. m., April 28, appeared 0.3 mile below Glymont, the distance between the two points being 10.9 miles; the current, therefore, was about 1.12 miles.

May 11 to 13, at 8.53 a. m., the current just beginning ebb, a float was started abreast the outlet. At 9 o'clock p. m. the following day, May 12, it was lost in a southeast gale, and found at 10.30 a. m., May 13 ashore, abreast of Fort Hunt long wharf. During this time it passed Fort Foote three times and Fort Washington five times.

Started at the first of ebb, the float reached Fort Foote, 4.3 miles, in 3 hours 35 minutes; Fort Washington (8.3 miles from Washington sewer outlet) in 6.08 hours, and having traveled 9.1 miles in 7.15 hours (a rate of 1.26 miles an hour); 8 hours 39 minutes after the start it again passed Fort Washington with the flood tide, and in 11.43 hours passed Fort Foote. In 12 hours 39 minutes, having traveled 5.2 miles north, the tide again turned from north to south (flood to ebb) and passed Fort Foote in 13 hours after the start, making a net down gain of 4.3 miles in 13 hours, during which time the float had traveled 14.6 miles. After 16.03 it passed Fort Washington, and 19.22 Marshall Hall

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(12.2 miles from Washington sewer outlet); 22.02 it passed Fort Washington on flood tide and 26.33 the same place on an ebb tide; 31.52 it was 0.5 mile south of Marshall Hall, excess of ebb tide 6.4 miles in 28 hours 58 minutes—0.22 per hour, 6.4 miles a day.

Ebb 7 hours 15 minutes, 9.1 miles; rate per hour, 1.26 miles.

Flood 5 hours 24 minutes, 5.2 miles; rate per hour, 0.97 mile.

Ebb 7 hours 31 minutes, 7.8 miles; rate per hour, 1.04 miles.

Flood 4 hours 44 minutes, 5.3 miles; rate per hour, 1.12 miles.

Ebb 6 hours 58 minutes, 6.3 miles; rate per hour, 0.90 mile.

May 14 to 15: A float was started at Washington sewer outlet about the beginning of ebb 10.40 a. m., and at 2.15 a. m., May 15, a squall put out the lights and the float was lost; found 3 hours later and put in channel.

Ebb for 8 hours 25 minutes, 8.4 miles; rate per hour, 1 mile.

Flood for 4 hours 40 minutes, 3.9 miles; rate per hour, 0.83 mile.

Excess of ebb, 4.5 miles in 13.05 hours—0.34 mile per hour or 8.2 per day. Float started at outlet, reached Fort Foote (4.3 miles) in 4 hours 38 minutes—rate, 0.93 mile. Fort Washington (8.3 miles), 7 hours 31 minutes—1.11 rate per hour. After reaching 0.2 mile south of Fort Washington a flood took it to 0.1 mile south of Fort Foote, and then ebb again 8.7 miles in 8.55—0.94 mile an hour.

May 18 to 22: At 9.19 a. m., May 18, a float was started abreast the Washington sewer outlet and observed night and day until May 22, 8.20 p. m., when a storm blew it ashore. During this 107 hours 1 minute the distance traveled by the float was 79.8 miles in 17 complete consecutive tides, 9 ebbs and 8 floods, during which the float passed the starting point 5 times. The southern limit of observation was 13.1 miles below Washington sewer outlet; the northern limit of observation was 1.7 miles above Washington sewer outlet. During the 8 tidal cycles there was an ebb excess of 12.3 miles in 98 hours 11 minutes—0.125 per hour or 3 miles per day in 73.5 miles traveled by the float.

ALEXANDRIA.

August 5, 1913: Float started abreast of Alexandria, Va., at the beginning of ebb tide; drifted 7.3 miles in 5 hours 30 minutes—1.3 miles an hour. Passed Fort Foote (3 miles) in 2 hours 40 minutes—1.13 miles per hour. Passed Fort Washington (7 miles) in 5 hours 10 minutes—1.35 miles per hour.

Fort Foote to Macalester wharf, Alexandria, 2.4 miles, 1.30 hours—1.6 miles per hour. Fort Washington to Macalester wharf, Alexandria, 6.4 miles, 4 hours—1.6 miles per hour.

August 12: In a complete flood tide from abreast of Alexandria the float traveled 3.2 miles in 5 hours 45 minutes—0.56 mile an hour. Reached sewer outlet, 1.9 miles, in 2 hours 37 minutes, or 0.73 mile an hour.

September 22: A float started as above from abreast Alexandria wharf during part of flood and part of ebb tide; flood, 3 hours 14 minutes—0.5 mile, or 0.16 mile an hour; ebb, 2 hours 27 minutes—1 mile, or 0.41 mile an hour.

September 24: One complete flood-tide float from same start drifted in 5 hours 11 minutes 2 miles—0.38 mile per hour.

October 15: A float from same start during part of ebb tide, 4 hours 35 minutes, 4.2 miles—0.75 mile per hour. Passed Fort Foote, 2.4 miles, in 2 hours 36 minutes—0.9 mile per hour.

October 29, 1913: A float started 8.21 a. m. abreast Macalester wharf, Alexandria, Va., during part of ebb tide, drifted 8.7 miles in 6 hours 8 minutes—1.42 miles per hour. Float passed Fort Foote wharf 2.4 miles in 1 hour 19 minutes—1.85 miles an hour. Float passed Fort Washington, 6.4 miles, in 3 hours 30 minutes—1.83 miles an hour.

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November 6, 1913: A float started for one complete flood tide from same place, 5 hours 21 minutes, 2.6 miles—0.49 mile per hour. Float passed Washington sewer outlet, 2 miles, in 3 hours 6 minutes—0.64 mile per hour.

JONES POINT LIGHT.

September 26: Floats started abreast Jones Point Light, Va. One complete flood tide the rate averages 0.7 mile; on ebb, 2 hours 20 minutes, drifted 1.3 miles, 0.1 mile north of Fort Foote—0.56; on flood, 5 hours 30 minutes, drifted 3.8 miles, 0.4 mile south of sewer outlet—0.7.

October 9, 1913: One complete flood tide, 5 hours 11 minutes, 3 miles—0.58 mile an hour. Starting at Jones Point Light, turns from ebb to flood, 0.7 mile north of Fort Foote; turns from flood to ebb 0.6 mile south of Washington sewer outlet.

FORT FOOTE, MD.

September 10, 1913: A float started 800 meters south of Riverview Wharf on flood tide, traveled 3.7 miles in 5 hours 12 minutes—0.71 mile an hour. Passed Fort Washington, 32 miles, in 5 hours—0.64 mile an hour.

October 7: Part of flood tide, float started abreast of wharf, flood 5 hours 6 minutes, 2.7 miles—0.53 miles per hour; passed MacAlester Wharf, 2.4 miles, in 3 hours 34 minutes—0.64 mile an hour.

MARSHALL HALL.

June 2, 1914: A float was started 12.57, June 2, abreast the wharf and observed until 3 a. m., June 4, when it was lost in a storm at night and found, 9.30 a. m., 100 feet southwest of lantern off Fort Washington. During this 38 hours and 3 minutes of continuous observation the float traveled 30.1 miles.

Southern limits of observations south of Marshall Hall, 5 miles. End of observations north of Marshall Hall, 3.3 miles. In the two tidal cycles observed there was an excess of flood—0.2 mile in 25 hours 32 minutes; the two flood tides totaling 10.1 miles and the ebbs 9.9 miles. Comparing the last flood and ebb, there was an excess flood in 24 hours 30 minutes of 2.5 miles—0.1 mile an hour.

June 8, 10.41 a. m.: A float started at ebb tide remained under observation until 4.10 a. m., June 9, when it was lost in a northeast gale abreast of black buoy 45, and found, June 13, 500 yards below Gunston Wharf, on the south side of Pohick Creek. The float starting from Marshall Hall went south 4.5 miles, then back north 5.4 miles (0.9 mile north of Marshall Hall), then south 5.7 miles (or 4.8 south of Marshall Hall)—a net gain south (ebb) of 0.3 mile in 16 hours 4 minutes—0.0186 per hour, or 0.446 per day.

June 9, 1914: At 3.35 p. m., on ebb tide, a float was started abreast of Marshall Hall Wharf and continued under observation until 1,20 p. m., June 13,, a period of 93 hours and 45 minutes, during which there were 15 consecutive tides—8 ebbs and 7 floods—in which period the float traveled a total distance of 88.4 miles—an average rate of 0.93 mile an hour. The southern limit of observations was 5.7 miles and the northern limit of observations was 8.5 miles. During the 86 hours 10 minutes of the 7 tidal cycles the float traveled 83.8 miles—0.97 mile an hour. There was a down gain (:. e., excess of ebb) during the 86 hours 10 minutes of 5.4 miles—down gain 1,5 miles in 24 hours.

June 22 to 27, 1914: A float was started abreast of Marshall Hall at 12.15 p. m. and continuously observed until June 27, 11.55 a. m. (4 days 23 hours 40 minutes), 119 hours 40 minutes, during which period it traveled 100 miles—0.835 mile an hour. There were 10 complete and 2 partial ebb tides and 9 full flood tides. In 18 consecutive tides (9 cycles) there was a down-stream gain

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(i. e., excess of ebb) of 5.7 miles in 110 hours 7 minutes, or 0.0518 mile per hour—1.24 miles per day. Flood, 53 hours 45 minutes, 43.7 miles—0.81 mile per hour, or 1.94 miles per day. Ebb, 56 hours 32 minutes, 49.4 miles—0.87 mile per hour, or 2.08 miles per day. The extreme limit north of Marshall Hall reached was 5 miles (1 mile north of Fort Washington); the extreme southern limit was 5.7 miles (0.5 mile north of Glymont). The total distance gained south of Marshall Hall was 5.3 miles. Including the start, the float passed Marshall Hall 17 times.

INDIANHEAD, MD.

July 20, 1914: A float was started abreast of Indianhead Wharf at 12.35 p. m. and observed until 11.10 p. m., June 23, 1914, when a storm ended the observation. During this period there were 13 consecutive tides, 7 floods and 6 ebbs. The southern limit below Indianhead was 1.7 miles. The northern limit above Indianhead was 6.1 miles. During 80 hours 16 minutes the float traveled 53 miles, or at a rate of 0.66 mile an hour, or 8 miles per day. Of the 6 complete cycles, flood for 37 hours 30 minutes—24.7 miles, or 0.66 mile per hour; and ebb for 36 hours 54 minutes—24.7 miles, or 0.67 mile per hour. There was a downstream excess of 0.95 mile in 74 hours and 24 minutes.

July 24, 1914: A float was started at 7.32 a. m. and observed until 11.43 a. m., when a storm interfered with the observations. During a complete ebb tide for 5 hours 45 minutes there was a down progress of 5.2 miles—0.92 mile an hour.

POSSUM POINT.

August 27, 1914: A float was started at 5.24 p. m. abreast of Possum Point and observed until 9.18 a. m., August 29, a period of 39 hours 54 minutes, during which the float traveled 31.2 miles. During the 6 consecutive tides (3 floods, 3 ebbs) the southern limit of observations was 1.6 miles; northern limit of observations was 4.2 miles. Over the period of 38 hours 12 minutes the float traveled 30.6 miles, with a downstream gain of 1.4 miles—0.0366 per hour, or 0.8784 mile per day.

October 19 to 23: A float was started, 1.22 p. m., abreast of Possum Point and continued under observation until October 23, 8.05, when the illness of the observer ended the observations. During this period of 102 hours 43 minutes the float traveled 88.1 miles. There were 16 consecutive tides, 8 floods and 8 ebbs, covering flood 48 hours 53 minutes, 41.1 miles—0.84 mile an hour. Ebb 49 hours 53 minutes, 44.3 miles—0.89 mile an hour. There was a downstream gain of 6.1 miles in the 98 hours 46 minutes—0.061 mile per hour, or 1.464 miles per day. The southern limit of observations, 9.5 miles from start to end. The northern limit of observations, 4 miles from start to end.

MARYLAND POINT LIGHTHOUSE.

September 11, 1914: A float was started abreast this point at 8.34 a. m. and observed until 12.21 p. m. September 12, 1914. During this period of 27 hours 47 minutes the float traveled 24.5 miles. There were 4 consecutive tides, during which 2 floods, 12 hours 13 minutes, traveled 9.7 miles—0.8 mile per hour; 2 ebbs, 12 hours 45 minutes, traveled 13.4 miles—1.05 miles per hour. There was a downstream (i. e., ebb) excess of 3.7 miles in the 25 hours 18 minutes—rate of 0.146 mile per hour, or 3.504 miles per day. Southern limits of observations, 7 miles from starting point; northern limits of observations, 1 mile from starting point.

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UPPER CEDAR POINT, MD.

September 22, 1914: A float was started abreast the lighthouse at the above point at 1.41 p. m. and continued under observation until 4 p. m. September 24, when a storm stopped the work. During this period of 50 hours 19 minutes the float traveled 55.6 miles. The northern limit of observation was 7.2 miles and the southern limit of observation was 4 miles from upper Cedar Point. During the observations, including start, the float passed the upper Cedar Point light nine times. There were eight consecutive tides (four floods and four ebbs). Floods 25 hours 3 minutes, float traveled 25.8 miles—1.03 miles per hour. Ebbs 24 hours 4 minutes, float traveled 29.1 miles—1.21 miles per hour. Downstream excess over 4 tides, 49 hours 7 minutes, of 3.3 miles—0.067 mile an hour, or 1.608 miles per day.

POPES CREEK, MD.

September 15, 1914: A float was started abreast this wharf at 12.02 p. m. and observed until September 16, 4.01 p. m., when the sea became too rough to continue. During this period of 27 hours 59 minutes the float traveled 13.8 miles. During 24 hours 56 minutes, covering 4 consecutive tides, the float traveled during flood for 10 hours 14 minutes 3.9 miles—0.38 mile per hour; ebb for 14 hours 42 minutes 9.6 miles—0.65 mile per hour. Plotting shows a downstream gain of 6 miles in the 24 hours 56 minutes—0.241 mile per hour, or 5.784 miles per day.

UPPER MACHODOC TO COLONIAL BEACH.

September 17, 1914: A float was started September 17, 8.46 a. m., abreast of can buoy 13 and observed until September 18, 7.22 p. m. During this period of 34 hours 36 minutes the float traveled 15.8 miles, the southern limit of observation being 7.2 miles and the northern limit being 0 mile from the starting point. During 4 consecutive tides, covering 25 hours 17 minutes, there were—flood, 9 hours 7 minutes, 2.5 miles; ebbs, 16 hours 10 minutes, 9.3 miles. There was a downstream excess of 7.2 miles in 25 hours 17 minutes—0.284 mile per hour, or 6.81 per day.

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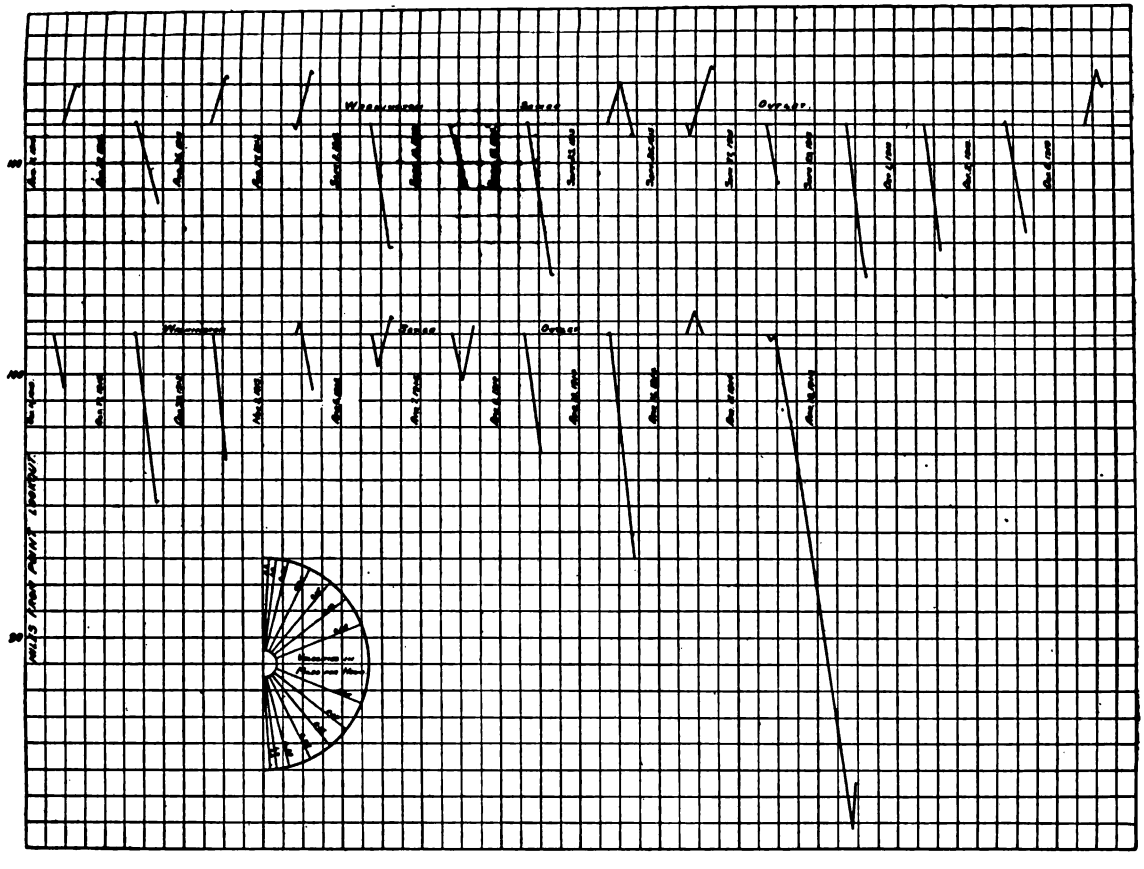

CHART N.—THE DISTANCES TRAVELED, VELOCITIES AND NET GAIN OF FLOATS STARTED AT THE WASHINGTON SEWER OUTLET AND OBSERVED BY THE U. S. COAST AND GEODETIC SURVEY.

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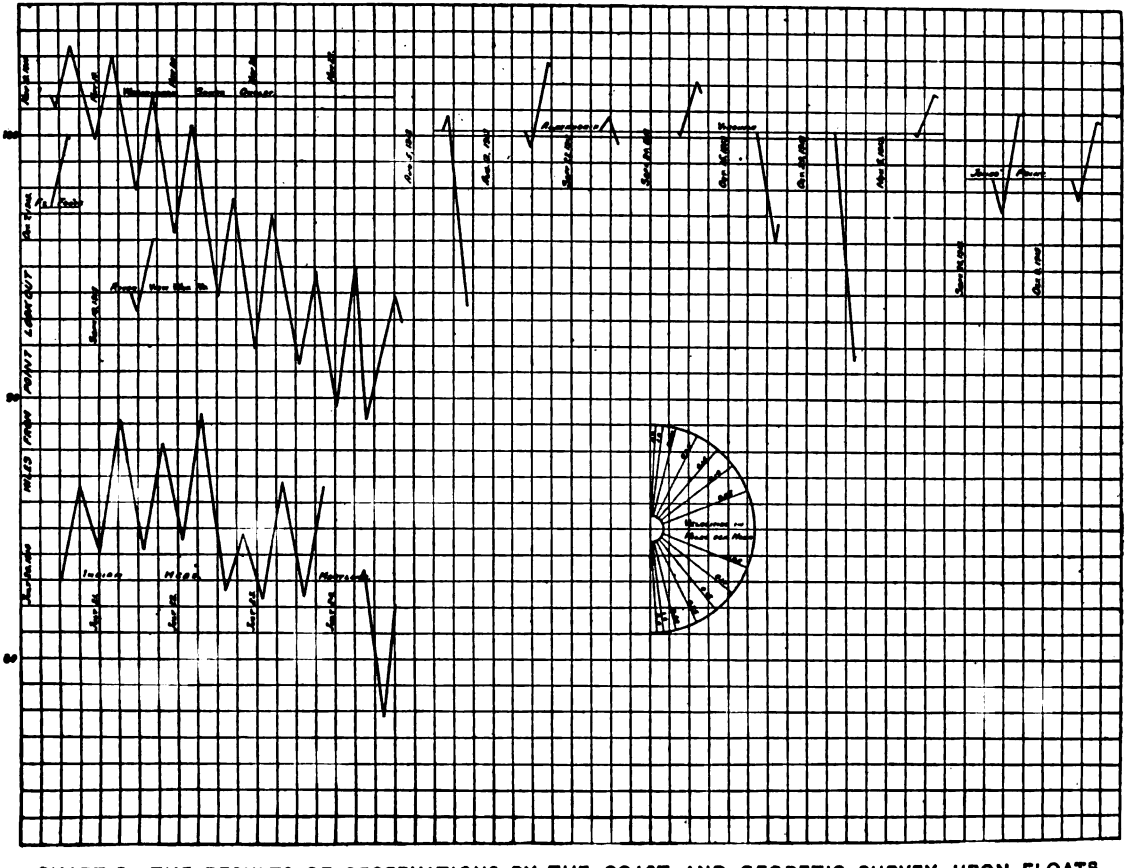

CHART O.—THE RESULTS OF OBSERVATIONS BY THE COAST AND GEODETIC SURVEY UPON FLOATS STARTED AT THE WASHINGTON SEWER OUTLET, ABREAST ALEXANDRIA, JONES POINT, FORT FOOTE,

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CHART P.—THE RESULT OF OBSERVATIONS BY THE COAST AND GEODETIC SURVEY UPON FLOATS STARTED AT CHAIN BRIDGE, AQUEDUCT BRIDGE, GEORGETOWN CHANNEL, GEORGETOWN SEWER, ANACOSTIA RIVER, AND WASHINGTON SEWER OUTLET, WITH TOTAL DISTANCES TRAVELED, VELOCITIES, AND NET GAIN.

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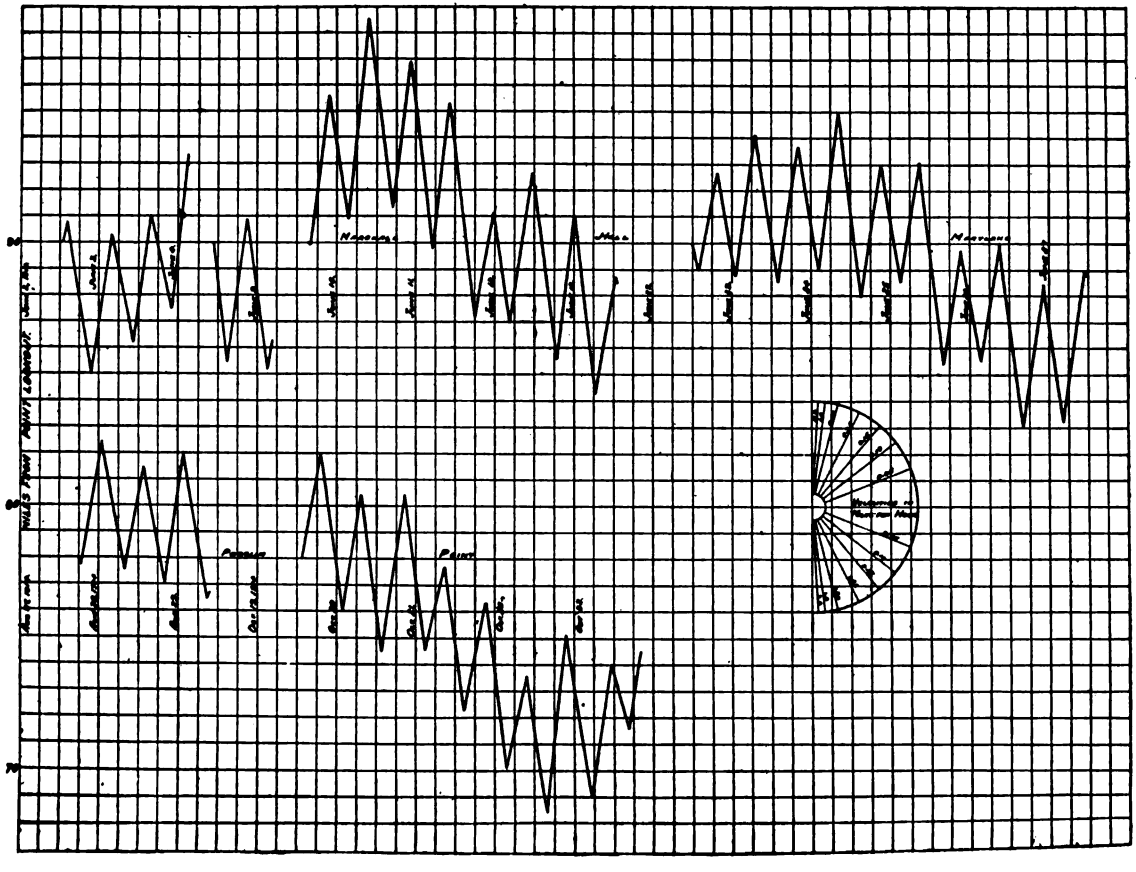

CHART Q.—THE RESULT OF OBSERVATIONS MADE BY THE COAST AND GEODETIC SURVEY UPON FLOATS STARTED AT MARSHALL HALL AND POSSUM POINT, WITH TOTAL DISTANCES TRAVELED, VELOCITIES,

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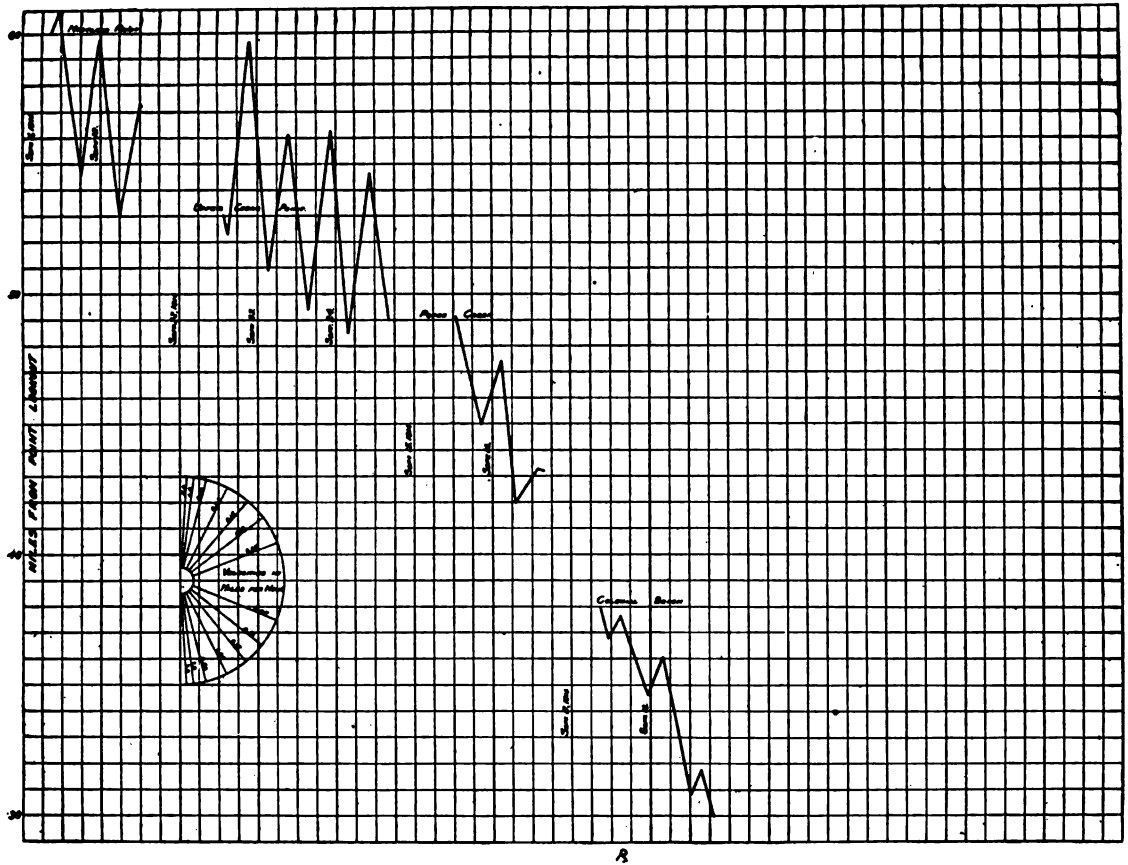

CHART R.—THE RESULT OF OBSERVATIONS MADE BY THE COAST AND GEODETIC SURVEY UPON FLOATS STARTED AT MARYLAND POINT, UPPER CEDAR POINT, POPES CREEK, AND COLONIAL BEACH, WITH TOTAL DISTANCES TRAVELED, VELOCITIES, AND NET GAIN.

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GENERAL DISCUSSION OF POTOMAC RIVER BY SECTIONS.

ABOVE GREAT FALLS.

North Branch.—The North Branch of the Potomac River, above Piedmont, W. Va., and Western Port, Md., drains a mountainous and heavily timbered country. The principal industries are mining and lumbering, and there is very little direct pollution except from the few privies along the stream. There is, however, a potential danger of infection from the use of this water because of its extremely rapid run-off. From Piedmont to Cumberland, the character of the river is considerably altered by the addition of large amounts of acid iron wastes entering through Georges Creek at Western Port and through Wills Creek at Cumberland. These streams traverse coal-mining regions and have a considerable population along their courses, Georges Creek being especially important in this respect. A considerable amount of trades wastes enters the two streams, together with crude sewage from the many towns. The effect of this sewage upon the stream, however, is remarkably reduced by the above-mentioned wastes, which act upon one another and upon the sewage in such a manner as to decrease considerably the bacterial content of the water. This action has been much more fully described in the report on the Cumberland and Piedmont region.

From Cumberland and Green Spring to the mouth of the South Branch of the Potomac there is very little direct pollution. The most important tributaries in this stretch of the river are Parsons Creek, on the south, and Evitts Creek, on the north. The watersheds of these streams are relatively uninhabited, being, for the most part, rough and mountainous, although there is more or less land suitable for agricultural pursuits along the valleys of the South Branch.

South Branch.—Two small towns and two tanneries discharge their effluents into this stream. Though the run-off from its watershed is quite rapid, the physical condition of the water where it joins the North Branch is relatively good, since the area is heavily timbered. The water from the South Branch is strikingly clear and sparkling when compared with that of the North Branch.

From Green Spring to Harpers Ferry.—From Green Spring, W. Va., to Williamsport, Md., the river flows through a tortuous channel, receiving drainage from a comparatively uninhabited region. Hence, from neither the north nor the south does direct pollution of any importance reach the river in this section.

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At Williamsport, Md., Conococheague Creek enters from the north. This stream drains a comparatively heavily populated agricultural and industrial region. On the stream and its tributaries are numerous large towns, most of which contribute pollution in the way of sewage and trades wastes. Many towns, however, along the stream dispose of their wastes by running them into crevices in the limestone, which underlies this whole area. This same practice obtains in the area drained by Antietam Creek, which has an area similar in all respects to that drained by the Conococheague. Between the entrances of these two streams the Opequon enters from the south. This stream drains an agricultural region and also receives the wastes from the towns of Martinsburg, W. Va., and Winchester, Va., which are comparatively large manufacturing communities.

Harpers Ferry.—At Harpers Ferry the Shenandoah River joins the Potomac. The Shenandoah is by far the largest tributary of the river and, as a matter of fact, has normally a larger flow than the Potomac above Harpers Ferry. The headwaters of the Shenandoah drain a wooded, mountainous country containing very few towns. Along the valleys of the river, however, are numerous towns, almost all of which discharge into it sewage and trades wastes. These valleys also constitute the largest agricultural areas in the watershed. As a result the river always carries a high turbidity after a rain. This turbidity can be traced downstream from the confluence of the Shenandoah with the Potomac for a considerable distance, as it tends to hug the south bank. Samples collected at Harpers Ferry showed practically no difference in bacterial content between Harpers Ferry and Great Falls. The only other tributary of importance is the Monocacy River, which drains a considerable agricultural area, lying mostly in Maryland. In this watershed are numerous towns, almost all of which contribute more or less direct sewage pollution. The use of this land for agricultural purposes also makes the Monocacy a very turbid stream after rains. The drainage area of Goose Creek, which enters the Potomac from the south, has a comparatively small population and receives very little direct pollution.

Great Falls.—Great Falls is the last station on the upper river. It therefore shows the net amount of pollution from the upper river to this point, and as the location of the intake for the Washington water supply it has been extensively studied. The results show that the water there is generally of fairly good quality, but is subject to wide fluctuations after rains, and during the spring floods becomes very bad. No direct pollution enters for 19 miles above Great Falls, and the most characteristic features are the abrupt changes in quality. The bacteriological findings at Dalecarlia Inlet do not show these sudden changes quite as strikingly as would samples from the falls themselves.

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Because of the prevalence of typhoid fever in the watershed, the rapid run-off of the river and its tributaries, and the consequent danger therefrom the raw water from the Potomac River at Great Falls is unsafe for use.

Since the foci of infection are scattered and largely rural, the treatment of the sewage of towns on the watershed would not entirely remove the danger of infection. There are, however, few places on the watershed where safe river water can not be secured by reasonable treatment.

BELOW GREAT FALLS.

The Potomac below the falls becomes broad, changes more slowly, and there are few interfering factors below the sewer outfalls of Washington and Alexandria; hence the conditions are favorable for laboratory investigation, and the work was concentrated upon this area. These results have been studied and developed and the data presented herein as to the conditions of "self-purification."

The section from Little Falls to Fort Foote is considered as the area of pollution, because the sewage and wastes from Washington, Georgetown, Alexandria, and the suburbs enter the river within that section.

Three Sisters.—Three Sisters is the highest station which could be reached by boat. It is nearly at the head of tidewater, and 10 miles below Great Falls. Some little pollution enters between these points, as is shown by the analyses, but there is very little. The tide rises and falls in this area, but, owing to the narrow channel, the consequent change in level is made up by the stream flow. The currents are seldom reversed, and, as the float tests show, "flood tide" consists in times of lowest stream flow, in a brief upward drift; while, in ordinary conditions, there is simply a retardation of the current.

From Three Sisters to Anacostia River.—The section of the river from Three Sisters to the junction of the main or Georgetown Channel with Anacostia River and Washington Channel comprises that portion of the river proper adjoining Washington and Georgetown. In addition to the pollution received above Three Sisters there is the direct sewage discharge of 7,000 persons, the drainage from Rock Creek and the Chesapeake & Ohio Canal, the discharge of a small city sewer, and effluents from numerous industrial plants, including several large breweries and a gas plant. Much of this pollution, however, will be carried to the city pumping station when the new interceptor is completed.

Float observations show that even during periods of lowest stream flow there is little real upward movement of water into this region during flood tides, upward drifts of floats at Giesboro Point diverg-

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ing into Anacostia and Washington Channels, where no stream flow exists.

The natural bed and channel of the section have been narrowed by engineering works, such as filling of the flats; except during freshets, the effect of flood tides therefore is merely to act as a dam to back up the water, and create a more or less stagnant condition, affected, on the one hand, by stream flow from above and, on the other, by the pollution received.

Reference to the charts showing float observations in this area will show the variations in current rate. May 28 the float traveled from Chain Bridge to a point 0.9 of a mile south of the sewer outlet in 31.35 hours—a velocity of 0.339 mile per hour. On November 1 the ebb velocity was 0.55 mile an hour, while in August, during low stream flow, a float required 97 hours and 29 minutes to make approximately the same distance—a rate of 0.109 mile per hour. It is an important fact that these periods of low stream flow and stagnation occur during the summer months.

Bacterial results obtained at four stations in this area give *B. coli* counts of more than 100 per c. c., or approximately five times as many as are found at Three Sisters. Such results show pollution which render this section unsafe and unsuitable for river bathing, and it should be noted that the upper intake of the Tidal Basin receives its flow from this region, and thus connects it with Washington Channel.

Washington Channel and Anacostia River constitute an important stagnant area, affected, especially the former, chiefly by tides. Except for the canal and coal shipping at Georgetown, all of the shipping of Washington is received in Washington Channel and at the navy yard on Anacostia River.

Float observations show that flood-tide movements are diverted by the stream flow in the main or Georgetown Channel into this area. Since the Washington sewer outlets are only 2 miles below this point, and storm water and other sewers empty directly into this section, a large amount of sewage from both sources enters this region. As a consequence, during periods of small stream flow this area is heavily polluted and the bottom is foul. The records show more than 500 *B. coli* per c. c. during August, and other gas-forming organisms are present in much greater numbers. Such conditions are present oftenest during the hot months, and the bubbling, the oxygen determinations, and the odors, as well as the bacteria, indicate a condition of putrefactive changes consequent upon excessive pollution.

When the plans of the District engineer are carried into effect, no sanitary sewage will, it is stated, enter this region directly. The conditions now sometimes encountered from the sewage pumping sta-

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tion to Giesboro Point should therefore disappear. It is probably true that much of the offensiveness of this area is due to the storm-water discharge, with its content of horse manure, etc.

Giesboro Point is only 1½ miles above the sewer outlets. It is about at the junction of the main channel, Anacostia and Washington Channels, and it is practically the cross section where the meeting of the upward flood currents and downward river flow results in a damming and retardation, rather than an upward flow. Hence the condition of the water at this point varies considerably, and, depending upon the stage of tide and flow of the river, may be very bad or better than sections within the reach of an ebb tide. Consequently during summer, when the stream flow is small, the water of this cross section is consistently the worst in the river; during the winter months, however, the flow is sufficient to outrun the flood-tide current, and the water here is greatly improved.

Washington sewage outlet.—About 1½ miles below Giesboro Point the sewage of Washington City is discharged from outlets on either side of the main channel at a depth of 25 to 30 feet, and the underrun of the polluted water is very marked, as is shown on the charts giving the results of analyses of surface and deep samples. The river in this vicinity was very carefully observed during the summer months, when evidences of excessive pollution and consequent nuisance would most probably be present.

The visible effect of the sewage is not very objectionable. At times a moderate amount of sleek is observable for a considerable distance in the direction of tidal flow, and matches, small bits of soap, paper, and other material may be seen floating in the sleek. At no time could the conditions be considered offensive or to constitute a nuisance; ordinarily the outlet discharges are not even evident. Even during hot weather the odor is very slight, and a disagreeable odor, at times noticeable in the vicinity, was greatest when the wind came from the Virginia shore, where a soap factory is located.

During the late summer months, when the high temperature of the water and the low stream flow from the upper river were coincident, and when, in consequence, the dilution was least and the danger of deficient oxidation with resultant nuisance was greatest, as many as 76 dissolved oxygen determinations were made daily upon fresh and incubated samples. The results show that for many years to come the river will have ample oxygen to care for the sewage from the estimated increased population of the vicinity.

A study of the float observations in the areas from Giesboro Point to Fort Foote or the stations immediately below shows clearly how slowly the water leaves this area of pollution; and if the study be confined to the stream and tidal flow alone, the bacterial and oxygen

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conditions appear inexplicable. When a broader study of the area is made, however, the difficulty is removed. In the section on plankton studies it is shown that the broad areas of flats constitute veritable natural sewage-disposal plants in which large quantities of sewage are speedily broken down and from which come biologically active agents and an enormous output of oxygen, the approximate quantity of which has been calculated by Prof. Phelps and which is contained in the chapter on Plankton Studies. These factors exert a potent influence in the purification of the river, both in the "area of pollution" and in the lower sections of the river where such purification is completed.

The float observations as well as the bacterial results show that, starting even at the beginning of an ebb tide, under ordinary conditions, material from the sewer outlet does not reach far below the Fort Foote cross section and, in extraordinary freshets, not much below Fort Washington.

The pollution introduced into the river above is thoroughly diffused when it reaches this section, and little pollution of consequence enters below; hence this part of the river is considered the "area of pollution," and the section from there to Maryland Point the "area of purification."

Fort Foote.—The various float observations in this region, from Giesboro Point to Whitestone Point especially, show that in discussing distances in miles due consideration must be observed for the variations of distance in time consequent upon different rates of stream flow. From Whitestone Point down, however, the large volume of the river below equalizes the minor fluctuations noticed above. From this point the effect of stream flow is of less importance, and times can be reliably calculated in which the water will progress. Owing to the balance of effects, the average condition of the water at Fort Foote throughout the year is remarkably constant. In the summer, when pollution in the river is more concentrated, the time elapsed in which the sewage reaches this point is enough to allow for considerable purification. In the winter, when the dilution is greatest, it is not so affected, and the increased pollution coming from the upper river makes up for the difference.

Although the bacteriological results at Fort Foote are fairly constant, those below vary enormously from month to month according to the stream flow. At Fort Washington during the summer, when the calculated flow is small and when the floats show that it takes considerable time for the water to get from Fort Foote to Fort Washington, the purification accomplished in this region is very great. At these times the water contains fewer intestinal organisms than at Great Falls, in spite of the fact that it has received the sewage from 350,000 people. In the winter, when the stream flow is large and the

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time of purification small, the extent of purification diminishes almost to nothing. There are very extensive flats opposite and above Fort Washington, which account for the rapid oxidation of the organic matter in the water when the conditions are worst, and so the bulk of the organic matter is either oxidized or settles out.

Mount Vernon and Marshall Hall.—The analyses at Mount Vernon and Marshall Hall also show some purification over those at Fort Washington during the summer, when the river flow is small. This difference is not very large, however, and the curves of each station are strikingly parallel, proving that there is little lag. When the stream flow is greater the difference becomes smaller, and during the winter samples were taken farther down, at Whitestone Point. As purification progresses the absolute change becomes less, and it is necessary to take samples farther apart in order to get observable differences. During the winter this is especially true, since, the stream flow being greater, the distances represent smaller time factors.

Whitestone Point.—Whitestone Point is the beginning of "Wide Water." From Little Falls down to this point the river is a deep channel, fringed at places with shallow flats bearing considerable vegetation. Below this point the river broadens out into somewhat shallow basins, opening to wide inlets and bays, while the real bed of the river is deep. Time and dilution become the most important factors. Though samples were not collected at the next three stations during the summer, the results show that at this point the pollution had very largely disappeared. In the large volumes of water below the remaining pollution would undoubtedly soon be lost. In the winter the muddy contaminated water sweeps well into this area, and the effect of time was thoroughly studied. Moreover, the effect of the wind in these broad areas creates a considerable wave action, and this stirs up the mud at the bottom. The float tests made in this area show the marked effect of the wind in influencing and even in reversing the tidal currents.

Indianhead to Maryland Point.—In the stretch of 25 miles between Indianhead and Maryland Point there exist many factors of importance in the further elimination of pollution. In the first place the enormous volume of water introduces most strongly the factor of dilution. Secondly, Occoquan Creek ("Bull Run") enters the river below and nearly opposite Indianhead, forming what is known as Occoquan Bay. This tributary brings some additional pollution, but, what is more important, after every rain on its watershed its water is heavily charged with finely divided red clay, which defines the channel for miles along the main river. Third, in this area, at cross sections determined by the stream flow from the upper river and by tidal phases, and varying from its upper limit or above, to

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about Smith's Point, occur the under run of salt water and the commingling of the two waters.

Within this area, therefore, occur enormous dilution, the introduction during freshets, when the time element is lessened, of a heavy suspension of finely divided matter, and of sea water, with its inability to carry large proportions of suspended matter. The stream flow is so small, compared with the total contents of this extensive area that, as the float observations show, the net down gain is very slight and the time element here most important. This area, therefore, is a great natural sedimentation basin, in which practically all of the pollution from the river above is disposed of.

About Maryland Point the river becomes quite salt and the precipitation of suspended matter is very apparent. The distance in time between this point and Possum Point is very great, even when the flow of the river is greatest. During a month of such flow there were less than seven *B. coli* per c. c., and in only three months did the number average more than one per c. c.

An inspection of the garbage-disposal plant of the city of Washington, located at Cherry Hill on the Virginia shore in this area, and the result of bacteriological analyses of effluents and water from the shore show that, while the place might be considered a nuisance on account of the odors, there is little, if any, danger of infection therefrom.

Extending out for a mile or so from Maryland Point is a flat, probably the result of sedimentation due to the meeting of the sea and river waters. The river at Maryland Point makes a right angle turn to the east and the 10-mile stretch from here to Popes Creek, which is called "Nanjemoy Reach," is 1 mile wide. This area receives no additional pollution other than agricultural wash from the shores and the Machodoc.

Within this area the organisms remaining from the sewage of Washington and the upper river are so few that the effects of reinfection are relatively large. The upper portion was considered the last in the study of self-purification of pollution from those sources, for within the area any traces of sewage pollution which may remain are practically eliminated. In only one month was *B. coli* present in less than 1 c. c., of water, there having been 1.2 *B. coli* per c. c. in January. The nearest high month showed only 0.35.

Popes Creek.—At what has been termed the Popes Creek cross section, from Popes Creek to Mathias Point, the river again makes a right angle turn, this time to the south. At this point, on the Maryland side, the river receives the water from Port Tobacco Creek, in which there is some pollution from rural sources. Near its mouth and about Popes Creek there is a considerable wash from various

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stock farms, the effects of which could be noticed in samples from the shore waters.

Popes Creek, 53 miles below Washington, is about the extreme upper limit of oyster beds in the Potomac River. The conditions as to saline content and food in the area between Popes Creek and Lower Cedar Point are favorable to the rapid growth of oyster spat, and from this area large numbers of oysters are taken for planting in waters of greater salinity. Oysters do not, as a rule, grow here to marketable size, owing to freshets which occur every year or so.

Lower Cedar Point to mouth of river.—From Lower Cedar Point to the mouth of the river, on both sides of the Potomac, in all of its estuaries, and on the "Kettle Bottom Shoals" in the middle of the river, the salinity of the water and its food content are most favorable to the propagation and growth of oysters. With the exception of small areas in the tributaries, which are rented to private planters by the States of Maryland and Virginia, all of these beds, which constitute one of the important natural shellfish areas of the country, are owned and policed by the two States. Hundreds of their citizens earn a livelihood from the large quantities of shellfish which they ship to all parts of the country, chiefly through Baltimore and Washington. Therefore elimination of the danger from infectious pollution reaching this area from the upper river and Washington would be of the utmost importance if such danger exists.

At Lower Cedar Point, during the month of the highest bacterial content here, there were only 0.25 *B. coli* per c. c., and the seasonal variation in this area is nowhere so striking as in upper region, the changes being probably due to local causes.

An analysis of the results of examination of oysters from all sections of the river and its tributaries, extending over an entire season, shows no single instance of dangerous pollution which may be attributed to the sewage from the river above the beds. An additional factor of safety, which is of interest and importance, is that during the winter period, when a large stream flow causes a decrease in the time element, the *B. coli* count in oysters does not increase with that in the water over the oyster beds, but is actually decreased. These results apparently confirm the observations of others as to the decrease in the functional activity of the oyster when the temperature is low. Subsequently these views have been definitely proven correct by a large number of direct observations at the Service experimental laboratory on Fisherman's Island.

A careful census was made of the boats and persons over the beds at the time when samples were taken, but the results show no pollution due to such cause. The dilution is enormous, the current over the beds is generally considerable, and the early diffusion so imper-

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fect that the probability of finding such pollution is remote. Almost all of the vessels and small boats used in the industry retire to creeks and coves for safety during the night, and it is believed such places and times are generally chosen by their crews to attend to the ordinary calls of nature. The oysters in the tributaries were not bad, but in some instances, as a result of local pollution, generally from agricultural wash, showed higher bacterial scores than those from the Potomac River.

Colonial Beach, the only urban community on this section of the river, has a large population during the summer, but only 1,000 throughout the months when oysters are taken in considerable quantity. The sewage from this community is emptied, after some delay in a receiving chamber, into Monroe Bay. During the oyster season a very large number of vessels, with at times a floating population of several hundred, put into this bay every night for safety. As a result an amount of fresh sewage is deposited over or near the private beds therein, and, despite the fact that no very high scores were obtained from oysters from this area, there is manifest danger of infection from this source. It is believed that oysters therefrom should not be sold. There may be some danger also in the oysters taken from the immediate vicinity of the drain just below Rock Point, a picture of which is shown, and from the cove between the wharf and residence at Lewisetta, though the immediate dilution at both places is enormous, and few, if any, oysters are grown here.

A few samples from Nomini Creek showed some counts, apparently due to local wash from the bridge, though it may have been from the small community. The introduction of water carriage for sewage would render this stream liable to pollution. Such instances, however, represent only a small and inconsiderable part of the extensive oyster-bearing areas of the Potomac River and its tributaries. It is believed that oysters from sources other than those specifically indicated are free from infectious pollution.

The small cost and ease with which artesian water is secured in this region have resulted in an abundant and safe supply at nearly every wharf and shucking house along the shore of the lower river. The impression gained by the inspection and by conversation with physicians is that there has been a decrease in the typhoid fever rate during recent years, and that such fever as does occur is most frequently present during the summer months and not during the oyster season.

The evidence from Colonial Beach proves that during the past year no typhoid fever could in any way have been attributed to eating shellfish from this section.

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SUMMARY OF RESULTS.

PROCEDURE AND SCOPE.

This report is the result of an investigation of the pollution of the Potomac River and its tributaries which was begun by the Public Health Service June 2, 1913, and continued until May 31, 1914. The investigation included a sanitary survey of the Potomac River watershed and laboratory studies of the water, mud, plankton, and shellfish. The sanitary survey included investigations as to the number of persons on the watershed, the prevalence and distribution of typhoid fever, the water supplies, sewage-disposal systems, and character and amounts of trade wastes.

As a result of the survey it was found that about 94.7 per cent of the population were served by public water supplies; that a smaller proportion, 38 per cent, were served by sewage-disposal systems. While typhoid fever was especially prevalent throughout the upper basin, the installation of water and sewerage systems and the increased activity of State and municipal health authorities have been followed by a decreasing typhoid rate, especially in the urban population; and the disease is now chiefly a rural one.

Following the investigation, intensive studies of sanitary conditions in certain sections and of important trade wastes are being, or have been, made by the Public Health Service. Laboratory studies were made of the conditions in the upper river, in the section from Piedmont to Cumberland, with special reference to the effect upon the sanitary conditions in the river and the effect upon them, and upon each other, of mine wastes and the effluent from pulp mills.

Throughout the time of the investigation an intensive study of the river was made from Great Falls to its mouth with special reference to possible excessive pollution and consequent nuisance in that portion of the river immediately near Washington and Alexandria, and with reference to the problems concerned in the self-purification of the river. Particular attention was given to the possibility of the spread of water-borne disease by shellfish taken from the beds in the lower portion of the river.

Laboratory studies were made in the Hygienic Laboratory, in a temporary laboratory installed at Colonial Beach, Va., on the service steamer *W. D. Bratton*, and for a month in the city laboratory at Cumberland, Md. These laboratory studies included 9,843 bacteriological analyses of water; 461 samples of shellfish for the determi-

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nation of the *B. coli* and total bacterial counts; 129 samples of mud from the river, examined for chemical, bacteriological, and microscropical data; 149 samples of water examined for plankton determinations; 43 samples of aquatic plants investigated; and approximately 3,000 samples of water for determination of the dissolved oxygen, nitrite, nitrate, chlorine, and other chemical contents.

Daily analyses were made of sewage from the Washington Sewage Pumping Station. Bacteriological examination was also made of 99 samples of shellfish and 118 samples of water collected by the Bureau of Chemistry, and 55 samples of oysters and 15 aquatic plants collected by the *Bratton* from the Chesapeake Bay and various tributaries, for comparison with those from the Potomac River. The conclusions reached, therefore, are the result of the examination of 615 samples of oysters, 13,240 samples of water, 149 samples of mud, and 43 aquatic plants.

CONCLUSIONS.

The investigation showed:

1. That at no point above Washington is the water of the Potomac River safe for use as a public water supply without reasonable treatment.

2. That portions of the main or Georgetown Channel, between the Chain Bridge and the junction of the main channel with Anacostia River and Washington Channel, are so heavily polluted that the water is unsafe for bathing purposes. The water from this section supplies the Tidal Basin.

3. That the condition of that area in Anacostia River in the neighborhood of the sewage-pumping station and at the junction of the three channels is bad during hot weather, at times constituting a nuisance; but that, when the improvements now planned or under construction are completed, these conditions should no longer exist.

4. That at no time was the condition over and about the Washington sewer outlet such as to constitute a nuisance.

5. That even during the period of lowest stream flow and highest temperature the river in the area of heaviest pollution—that is, between Giesboro Point and Fort Foote—has at all times sufficient oxygen available for the sewage now discharged into the river, and enough to take care of the sewage which will probably be added for several years to come.

6. That in addition to the dissolved oxygen contained in the water of the river as it flows from the Great Falls, the great areas of flats on each side of the river for many miles act as oxygen generators. The amount of oxygen given off, depending in part upon the condition of plant life, turbidity, and sunshine, is therefore greatest during the summer, when there is the most need for it.

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7. That in addition to releasing enormous volumes of ogygen, these flats are breeding places for plankton forms, which themselves materially assist by biological processes in the breaking down of sewage and the consequent purification of the river.

8. That the section of the river from Indianhead to Maryland Point, known as "Wide Water," is a great natural purification basin, in which the factors of time, dilution, oxidation, sedimentation due to irregularity in velocity and direction of current, and to the mingling of the sea and river waters, together with the biological processes, all unite to accomplish the death of intestinal organisms and the breaking down of sewage compounds.

As a consequence few intestinal organisms from above reach Maryland Point, and these disappear in the stretch of 10 miles between that point and Popes Creek, at which section evidence of pollution from the upper river has disappeared.

9. In an examination of oysters from all the beds in the whole river and its tributaries, extending over an entire season, no dangerously polluted oysters were found in the Potomac River proper. The very few polluted samples found came from localities from which few oysters are shipped.

Analysis of the results obtained during the year in the examination of shellfish and of water taken from over the oyster beds shows that the periods of highest *B. coli* count in the two were not coincident. The highest *B. coli* content of the water was found during those periods of winter when large stream flow reduced the time factor. The lowest *B. coli* content of the oysters was found during the same periods, when the temperature of the water was low.

10. While the time occupied in the transfer of continuously suspended matter from the Washington sewer outlets to the upper limits of the shellfish beds has not been determined by observations upon any float which traversed the whole area, nor by a sufficient number of floats over the lower area, it is certain that, even under conditions of ordinary high stream flow, such as prevail during the spring months, at least two or three weeks are ordinarily required for such transfer.

From the observations made April 27 and 28, 1914, it is evident that, under conditions of unusual flood, at least some portion of water would travel the distance in a much shorter period of time. The bacteriological results obtained, however, in the lower river after this flood give no evidence that excessive pollution reached that section even under such conditions. The gelatin counts, which so quickly indicate sudden changes, the 37° agar count, and the *B. coli* determinations upon water and oysters all show that between Possum Point and Popes Creek the pollution has been eliminated. Only

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one sample at Popes Creek from April 24 to May 7 showed *B. coli* in 1 c. c., the average being less than 1 in 10 c. c.

11. Parallel series of hundreds of samples of sewage, of water, and of shellfish were studied to determine the value of the lactose bile presumptive test, and the relative values of lactose bile and lactose broth, as well as the usefulness of the endo medium and of lactose litmus agar for the determination of *B. coli*. Observations were also made as to the relative values of agar and of gelatin for the determination of the total bacterial count under varying conditions.

As a result of these studies it is recommended that the lactose bile presumptive test be not used, because of the unreliable results obtained therefrom; and that the use of lactose broth fermentation tubes, with confirmation on endo medium, be adopted as a routine procedure in the examination of water and shellfish for the determination of the presence of *B. coli*.

The presence and significance of anaerobic spore-bearing lactose-splitting organisms has been studied; it has been shown that the presence of such organisms does not necessarily indicate recent or dangerous pollution, and that they are of little sanitary significance. The somewhat constant and close relationship between *B. coli* and total counts on nutrient agar at 37° is discussed, as well as the value of gelatin in showing sudden changes in river conditions.

An analysis of the samples has been made for the purpose of determining the death rate of *B. coli* under varying conditions of time and temperature, such as have existed in the Potomac River.

During the study of self-purification of the Potomac River the most striking fact brought out was the enormous variation in bacterial conditions at the sampling stations during different periods of the year.

When considered individually the results appear quite inexplicable, but when the factor of time is taken into consideration they fall into an orderly array and may be accounted for by variations in stream flow. The results may be explained by the rational theory that, under similar conditions, approximately the same percentage purification takes place in equal times. The death rate of *B. coli* is increased by higher temperatures during the summer months, and is greater in freshly polluted water.

12. That notwithstanding the especially favorable natural conditions attending the present disposal by dilution of the sewage of the District of Columbia it is inevitable that, in consequence of a continued increase in the population of the District of Columbia, the capacity of the river to dispose of sewage without nuisance or danger will eventually be overtaxed. It is therefore desirable that primary treatment works should be installed in the near future sufficient to clarify the sewage up to the limits to which plain sedi-

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mentation may be advantageously carried. The cost of construction and operation of these treatment works would not be such as to be prohibitive when considered in connection with the benefits to be derived. They should be so designed as to work in harmony with the favorable conditions locally afforded by nature for sewage disposal. These works should be sufficient to maintain a reasonable constant as to the amount of organic matter dependent on the river for purification. Their construction is also desirable in recognition of the advancing standards as to hygienic cleanliness of river waters, as well as for the example in such matters which should be afforded by the national capital.

To the end that necessary basic data for the design of such works may be available when needed and that the latest advances in sewage disposal may be properly investigated as applied to the Washington sewage, it is desirable that provision be made at the present time for definite experimental field studies. Such provision should take the form of a small sewage testing station equipped with experimental tanks and other devices suitable for these studies. The data obtained would be of the greatest immediate value in its application to the particular problems of the District of Columbia, and such a station would also be in position to investigate and report upon many of the newer processes of sewage treatment which are being advanced from time to time, and upon the merits of which there is entirely insufficient information. The gathering of such information would be of nation-wide importance.

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HYGIENIC LABORATORY BULLETINS OF THE PUBLIC HEALTH SERVICE.

The Hygienic Laboratory was established in New York, at the Marine Hospital on Staten Island, August, 1887. It was transferred to Washington, with quarters in the Butler Building, June 11, 1891, and a new laboratory building, located in Washington, was authorized by act of Congress March 3, 1901.

The following *bulletins* [Bulls. Nos. 1–7, 1900 to 1902, Hyg. Lab., U. S. Mar.-Hosp. Serv., Wash.] have been issued:

*No. 1.—Preliminary note on the viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 2.—Formalin disinfection of baggage without apparatus. By M. J. Rosenau.

*No. 3.—Sulphur dioxid as a germicidal agent. By H. D. Geddings.

*No. 4.—Viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 5.—An investigation of a pathogenic microbe (*B. typhi murium* Danyz) applied to the destruction of rats. By M. J. Rosenau.

*No. 6.—Disinfection against mosquitoes with formaldehyde and sulphur dioxid. By M. J. Roesnau.

†No. 7.—Laboratory technique: Ring test for indol, by S. B. Grubbs and Edward Francis; Collodium sacs, by S. B. Grubbs and Edward Francis; Microphotography with simple apparatus, by H. B. Parker.

By act of Congress approved July 1, 1902, the name of the "United States Marine-Hospital Service" was changed to the "Public Health and Marine-Hospital Service of the United States," and three new divisions were added to the Hygienic Laboratory.

Since the change of name of the service the bulletins of the Hygienic Laboratory have been continued in the same numerical order as follows:

*No. 8.—Laboratory course in pathology and bacteriology. By M. J. Rosenau. (Revised edition, March, 1904.)

†No. 9.—Presence of tetanus in commercial gelatin. By John F. Anderson.

*No. 10.—Report upon the prevalence and geographic distribution of hookworm disease (uncinariasis or anchylostomiasis) in the United States. By Ch. Wardell Stiles.

*No. 11.—An experimental investigation of *Trypanosoma lewisi*. By Edward Francis.

*No. 12.—The bacteriological impurities of vaccine virus; an experimental study. By M. J. Rosenau.

*No. 13.—A statistical study of the intestinal parasites of 500 white male patients at the United States Government Hospital for the Insane; by Philip E. Garrison, Brayton H. Ransom, and Earle C. Stevenson. A parasitic roundworm (*Agamomermis culicis* n. g., n. sp.) in American mosquitoes (*Culex sollicitans*); by Ch. Wardell Stiles. The type species of the cestode genus *Hymenolepis;* by Ch. Wardell Stiles.

*No. 14.—Spotted fever (tick fever) of the Rocky Mountains; a new disease. By John F. Anderson.

*No. 15.—Inefficiency of ferrous sulphate as an antiseptic and germicide. By Allen J. McLaughlin.

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*No. 16.—The antiseptic and germicidal properties of glycerin. By M. J. Rosenau.

*No. 17.—Illustrated key to the trematode parasites of man. By Ch. Wardell Stiles.

*No. 18.—An account of the tapeworms of the genus *Hymenolepis* parasitic in man, including reports of several new cases of the dwarf tapeworm (*H. nana*) in the United States. By Brayton H. Ransom.

*No. 19.—A method for inoculating animals with precise amounts. By M. J. Rosenau.

*No. 20.—A zoological investigation into the cause, transmission, and source of Rocky Mountain "spotted fever." By Ch. Wardell Stiles.

*No. 21.—The immunity unit for standardizing diphtheria antitoxin (based on Ehrlich's normal serum). Official standard prepared under the act approved July 1, 1902. By M. J. Rosenau.

*No. 22.—Chloride of zinc as a deodorant, antiseptic, and germicide. By T. B. McClintic.

*No. 23.—Changes in the Pharmacopœia of the United States of America. Eighth decennial revision. By Reid Hunt and Murray Galt Motter.

No. 24.—The International Code of Zoological Nomenclature as applied to medicine. By Ch. Wardell Stiles.

*No. 25.—Illustrated key to the cestode parasites of man. By Ch. Wardell Stiles.

*No. 26.—On the stability of the oxidases and their conduct toward various reagents. The conduct of phenolphthalein in the animal organism. A test for saccharin, and a simple method of distinguishing between cumarin and vanillin. The toxicity of ozone and other oxidizing agents to lipase. The influence of chemical constitution on the lipoytic hydrolysis of etheral salts. By J. H. Kastle.

*No. 27.—The limitations of formaldehyde gas as a disinfectant with special reference to car sanitation. By Thomas B. McClintic.

*No. 28.—A statistical study of the prevalence of intestinal worms in man. By Ch. Wardell Stiles and Philip E. Garrison.

No. 29.—A study of the cause of sudden death following the injection of horse serum. By M. J. Rosenau and John F. Anderson.

†No. 30.—I. Maternal transmission of immunity to diphtheria toxine. II. Maternal transmission of immunity to diphtheria toxine and hypersusceptibility to horse serum in the same animal. By John F. Anderson.

†No. 31.—Variations in the peroxidase activity of the blood in health and disease. By Joseph H. Kastle and Harold L. Amoss.

†No. 32.—A stomach lesion in guinea pigs caused by diphtheria toxine and its bearing upon experimental gastric ulcer. By M. J. Rosenau and John F. Anderson.

*No. 33.—Studies in experimental alcoholism. By Reid Hunt.

†No. 34.—I. *Agamofilaria georgiana* n. sp., an apparently new roundworm parasite from the ankle of a negress. II. The zoological characters of the roundworm genus *Filaria* Mueller, 1787. III. Three new American cases of infection of man with horsehair worms (species *Paragordius varius*), with summary of all cases reported to date. By Ch. Wardell Stiles.

†No. 35.—Report on the origin and prevalence of typhoid fever in the District of Columbia. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle. (Including articles contributed by Ch. Wardell Stiles, Joseph Goldberger, and A. M. Stimson.)

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†No. 36.—Further studies upon hypersusceptibility and immunity. By M. J. Rosenau and John F. Anderson.

†No. 37.—Index-catalogue of medical and veterinary zoology. Subjects: Trematoda and trematode diseases. By Ch. Wardell Stiles and Albert Hassall.

No. 38.—The influence of antitoxin upon post-diptheritic paralysis. By M. J. Rosenau and John F. Anderson.

†No. 39.—The antiseptic and germicidal properties of solutions of formaldehyde and their actions upon toxines. By John F. Anderson.

†No. 40.—1. The occurrence of a proliferating cestode larva (*Sparganum proliferum*) in man in Florida, by Ch. Wardell Stiles. 2. A reexamination of the type specimen of *Filaria restiformis* Leidy, 1880=*Agamomermis restiformis*, by Ch. Wardell Stiles. 3. Observations on two new parasitic trematode worms: *Homalogaster philippinensis* n. sp., *Agamodistomum nanus* n. sp., by Ch. Wardell Stiles and Joseph Goldberger. 4. A reexamination of the original specimen of *Tænia saginata abietina* (Weinland, 1858), by Ch. Wardell Stiles and Joseph Goldberger.

†No. 41.—Milk and its relation to the public health. By various authors.

†No. 42.—The thermal death points of pathogenic microorganisms in milk. By M. J. Rosenau.

†No. 43.—The standardization of tetanus antitoxin (an American unit established under authority of the act of July 1, 1902). By M. J. Rosenau and John F. Anderson.

No. 44.—Report No. 2 on the origin and prevalence of typhoid fever in the District of Columbia, 1907. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle.

†No. 45.—Further studies upon anaphylaxis. By M. J. Rosenau and John F. Anderson.

No. 46.—*Hepatozoon perniciosum* (n. g., n. sp.); a hæmogregarine pathogenic for white rats; with a description of the sexual cycle in the intermediate host, a mite (*Ielaps echidnimus*). By W. W. Miller.

No. 47.—Studies on thyroid: I. The relation of iodine to the physiological activity of thyroid preparations. By Reid Hunt and Atherton Seidell.

No. 48.—The physiological standardization of digitalis. By Charles Wallis Edmunds and Worth Hale.

No. 49.—Digest of comments on the United States Pharmacopœia. Eighth decennial revision for the period ending December 31, 1905. By Murray Galt Motter and Martin I. Wilbert.

No. 50.—Further studies upon the phenomenon of anaphylaxis. By M. J. Rosenau and John F. Anderson.

No. 51.—Chemical tests for blood. By Joseph H. Kastle.

No. 52.—Report No. 3 on the origin and prevalence of typhoid fever in the District of Columbia (1908). By M. J. Rosenau, Leslie L. Lumdsen, and Joseph H. Kastle.

No. 53.—The influence of certain drugs upon the toxicity of acetanilide and antipyrine. By Worth Hale.

No. 54.—The fixing power of alkaloids on volatile acids and its application to the estimation of alkaloids with the aid of phenolphthalein or by the Volhard method. By Elias Elvove.

No. 55.—Quantitative pharmacological studies; adrenalin and adrenalinlike bodies. By W. H. Schultz.

No. 56.—Milk and its relation to the public health. (Revised edition of Bulletin No. 41). By various authors.

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No. 57.—I. The presence of tubercle bacilli in the circulating blood in clinical and experimental tuberculosis. By John F. Anderson. II. The viability of the tubercle bacillus. By M. J. Rosenau.

No. 58.—Digest of comments on the Pharmacopœia of the United States of America (eighth decennial revision) and the National Formulary for the period ending December 31, 1906. By Murray Galt Motter and Martin I. Wilbert.

No. 59.—The oxidases and other oxygen catalysts concerned in biological oxidations. By Joseph Hoeing Kastle.

No. 60.—A study of the anatomy of Watsonius (n. g.), Watsoni of man, and of 19 allied species of mammalian trematode worms of the superfamily Paramphistomoidea. By Ch. Wardell Stiles and Joseph Goldberger.

No. 61.—Quantitative pharmacological studies: Relative physiological activity of some commercial solutions of epinephrin. By W. H. Schultz.

No. 62.—The taxonomic value of the miscroscopic structure of the stigmal plates in the tick genus *Dermacentor*. By Ch. Wardell Stiles.

† No. 63.—Digest of comments on the Pharmacopœia of the United States of America (eighth decennial revision) and the National Formulary (third edition) for the calendar year ending December 31, 1907. By Murray Galt Motter and Martin I. Wilbert.

No. 64.—Studies upon anaphylaxis with special reference to the antibodies concerned. By John F. Anderson and W. H. Frost.

No. 65.—Facts and problems of rabies. By A. M. Stimson.

No. 66.—I. The influence of age and temperature on the potency of diphtheria antitoxin. By John F. Anderson. II. An organism (*Pseudomonas protea*) isolated from water, agglutinated by the serum of typhoid-fever patients. By W. H. Frost. III. Some consideration on colorimetry, and a new colorimeter. By Norman Roberts. IV. A gas generator in four forms, for laboratory and technical use. By Norman Roberts.

† No. 67.—The solubilities of the pharmacopœial organic acids and their salts. By Atherton Seidell.

No. 68.—The bleaching of flour and the effect of nitrites on certain medicinal substances. By Worth Hale.

No. 69.—The effects of restricted diet and of various diets upon the resistance of animals to certain poisons. By Reid Hunt.

No. 70.—A study of melting point determinations with special reference to the melting point requirements of the United States Pharmacopœia. By George A. Menge.

No. 71.—1. Some known and three new endoparasitic trematodes from American fresh-water fish. By Joseph Goldberger. 2. On some new parasitic trematode worms of the genus *Telorchis*. By Joseph Goldberger. 3. A new species of *Athesmia* from a monkey. By Joseph Goldberger and Charles G. Crane.

† No. 72.—I. Report on an outbreak of typhoid fever at Omaha, Nebr. (1909–1910), by L. L. Lumsden. II. The water supply of Williamson, W. Va., and its relation to an epidemic of typhoid fever. By W. H. Frost.

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No. 76.—The physiological standardization of ergot. By Charles Wallis Edmunds and Worth Hale.

No. 77.—Sewage pollution of interstate and international waters with special reference to the spread of typhoid fever. By Allan J. McLaughlin.

No. 78.—Report No. 4 on the origin and prevalence of typhoid fever in the District of Columbia (1909). By L. L. Lumsden and John F. Anderson. (Including articles contributed by Thomas B. McClintic and Wade H. Frost.)

No. 79.—Digest of comments on the Pharmacopœia of the United States of America (eighth decennial revision) and the National Formulary (third edition) for the calendar year ending December 31, 1910. By Murray Galt Motter and Martin I. Wilbert.

No. 80.—Physiological studies in anaphylaxis. Reaction of smooth muscle from various organs of different animals to proteins. (Including reaction of muscle from nonsensitized, sensitized, tolerant, and immunized guinea pigs.) By William H. Schultz.

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No. 83.—I. Sewage pollution of interstate and international waters with special reference to the spread of typhoid fever. II. Lake Superior and St. Marys River. III. Lake Michigan and the Straits of Mackinac. IV. Lake Huron, St. Clair River, Lake St. Clair, and the Detroit River. V. Lake Ontario and St. Lawrence River. By Allan J. McLaughlin.

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No. 85.—Index catalogue of medical and veterinary zoology. Subjects: Cestoda and cestodaria. By Ch. Wardell Stiles and Albert Hassall.

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No. 88.—Method for determining the toxicity of coal-tar disinfectants, together with a report on the relative toxicity of some commercial disinfectants. By Worth Hale.

No. 89.—Sewage pollution of interstate and international waters with special reference to the spread of typhoid fever. VI. The Missouri River from Sioux City to its mouth. By Allan J. McLaughlin.

No. 90.—Epidemiologic studies of acute anterior poliomyelitis. I. Poliomyelitis in Iowa, 1910. II. Poliomyelitis in Cincinnati, Ohio, 1911. III. Poliomyelitis in Buffalo and Batavia, N. Y., 1912. By Wade H. Frost.

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No. 94.—I. Collected studies on the insect transmission of *Trypanosoma evansi*. By M. Bruin Mitzmain. II. Summary of experiments in the transmission of anthrax by biting flies. By M. Bruin Mitzmain.

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No. 96.—1. Report of investigation of coastal waters in the vicinity of Gulfport and Biloxi, Miss., with special reference to the pollution of shellfish. By R. H. Creel. 2. A comparison of methods for the determination of oxygen in waters in presence of nitrite. By Elias Elvove. 3. Some new compounds of the choline type; (III) including preparation of monoacetate of α, *B* dioxy-*B*-methyl butane. By G. A. Menge. 4. The detection of white phosphorus in matches. By Earle B. Phelps. 5. The chemical composition of rubber in nursing nipples and in some rubber toys. By Earle B. Phelps and Albert F. Stevenson. 6. The analysis of thymol capsules. By Atherton Seidell. 7. Seasonal variation in the composition of the thyroid gland. By Atherton Seidell and Frederic Fenger. 8. Note on a new apparatus for use with the Winkler method for dissolved oxygen in water. By Hyman L. Shoub. 9. The pharmacological action of some serum preservatives. By Carl Voegtlin.

No. 97.—1. Some further siphonaptera. 2. A further report on the identification of some siphonaptera from the Philippine Islands. 3. The taxonomic value of the copulatory organs of the females in the order siphonaptera. By Carroll Fox.

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No. 99.—The Friedmann treatment for tuberculosis: A report of the board appointed for its investigation. By John F. Anderson and Arthur M. Stimson.

No. 100.—1. Pituitary standardization; a comparison of the physiological activity of some commercial preparations. By George B. Roth. 2. Examination of drinking water on railroad trains. By Richard H. Creel. 3. Variation in the epinephrine content of suprarenal glands. By Atherton Seidell and Frederic Fenger.

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No. 102.—I. Digitalis standardization. The physiological evaluation of fat free digitalis and commercial digitalin. By George B. Roth. II. Preliminary observations on metabolism in pellagra. By Andrew Hunter, Maurice H. Givens, and Robert C. Lewis.

No. 103.—I. Chemical changes in the central nervous system as a result of restricted vegetable diet. By Mathilde Koch and Carl Voegtlin. II. Chemical changes in the central nervous system in pellagra. By Mathilde Koch and Carl Voegtlin.

No. 104.—Investigation of the pollution and sanitary conditions of the Potomac watershed, with special reference to self-purification and the sanitary condition of shellfish in the lower Potomac River. By Hugh S. Cumming. With plankton studies by W. C. Purdy, and Hydrographic studies by Homer P. Ritter.

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FIG. 1.—SEWAGE-DISPOSAL PLANT AT CHAMBERSBURG, PA. IMHOFF TANK.

FIG. 2.—SEWAGE-DISPOSAL PLANT AT CHAMBERSBURG, PA. SPRINKLING FILTERS.

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FIG. 3.—SEWAGE-DISPOSAL PLANT AT CHAMBERSBURG, PA. FINAL SEDIMENTATION TANKS.

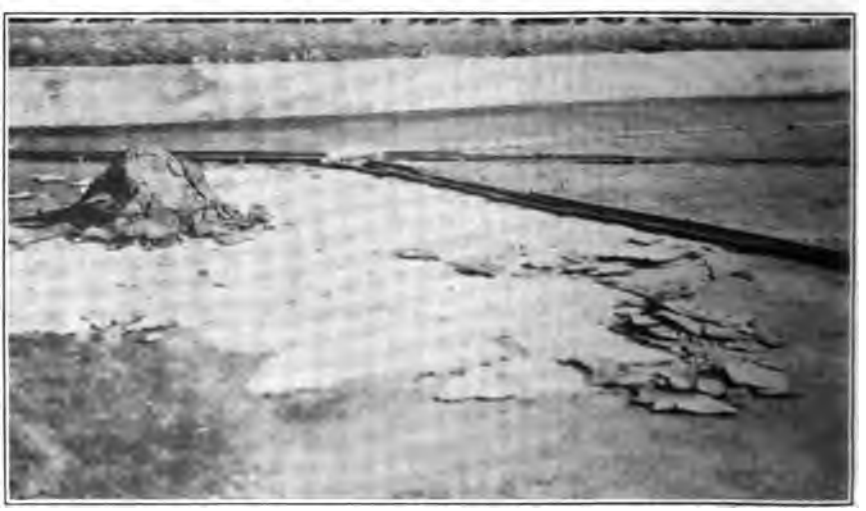

FIG. 4.—SEWAGE-DISPOSAL PLANT AT CHAMBERSBURG, PA. SLUDGE BEDS.

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FIG. 5.—SEWAGE-DISPOSAL PLANT AT WINCHESTER, VA. INTERMITTENT SAND FILTRATION.

FIG. 6.—OUTLET OF SEWER SHOWING LARGE AMOUNT OF SCUM. HARRISONBURG, VA.

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FIG. 7.—RAPID SAND FILTRATION PLANT, FRONT ROYAL, VA. THE TOWN CAN BE SEEN IN THE BACKGROUND.

FIG. 8.—DREDGE USED IN COLLECTING SAMPLES OF OYSTERS.

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FIG. 9.—TYPE OF BOATS USED FOR OYSTER DREDGING.

FIG. 10.—OYSTER TONGERS AT WORK.

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FIG. 11.—BOTTLEHOLDER FOR TAKING SURFACE SAMPLES.

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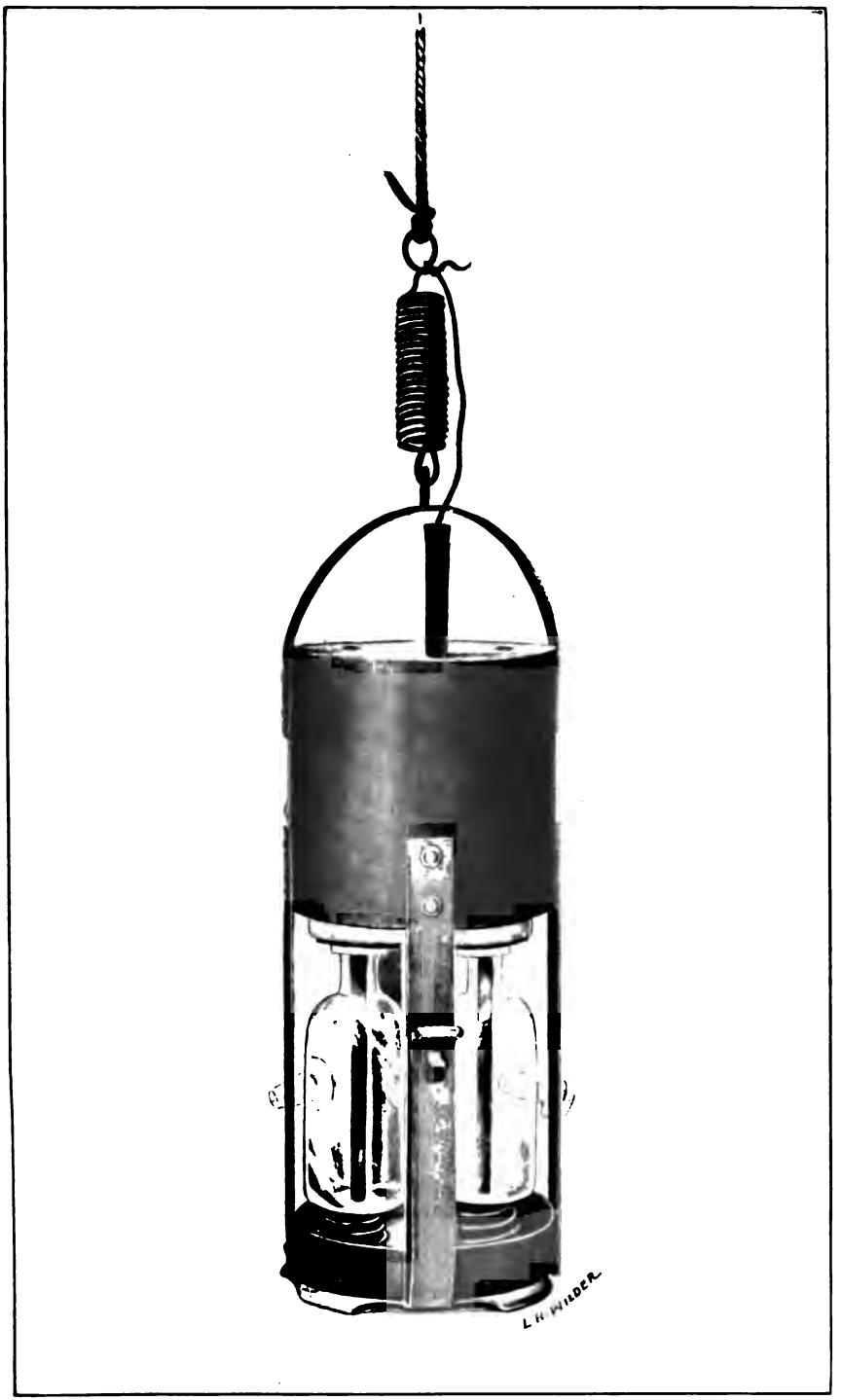

FIG. 12.—VIEW OF APPARATUS DESIGNED FOR THE COLLECTION OF DISSOLVED OXYGEN.

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FIG. 13.—SECTIONAL VIEW OF APPARATUS DESIGNED FOR THE COLLECTION OF DUPLICATE SAMPLES FOR THE DETERMINATION OF DISSOLVED OXYGEN.

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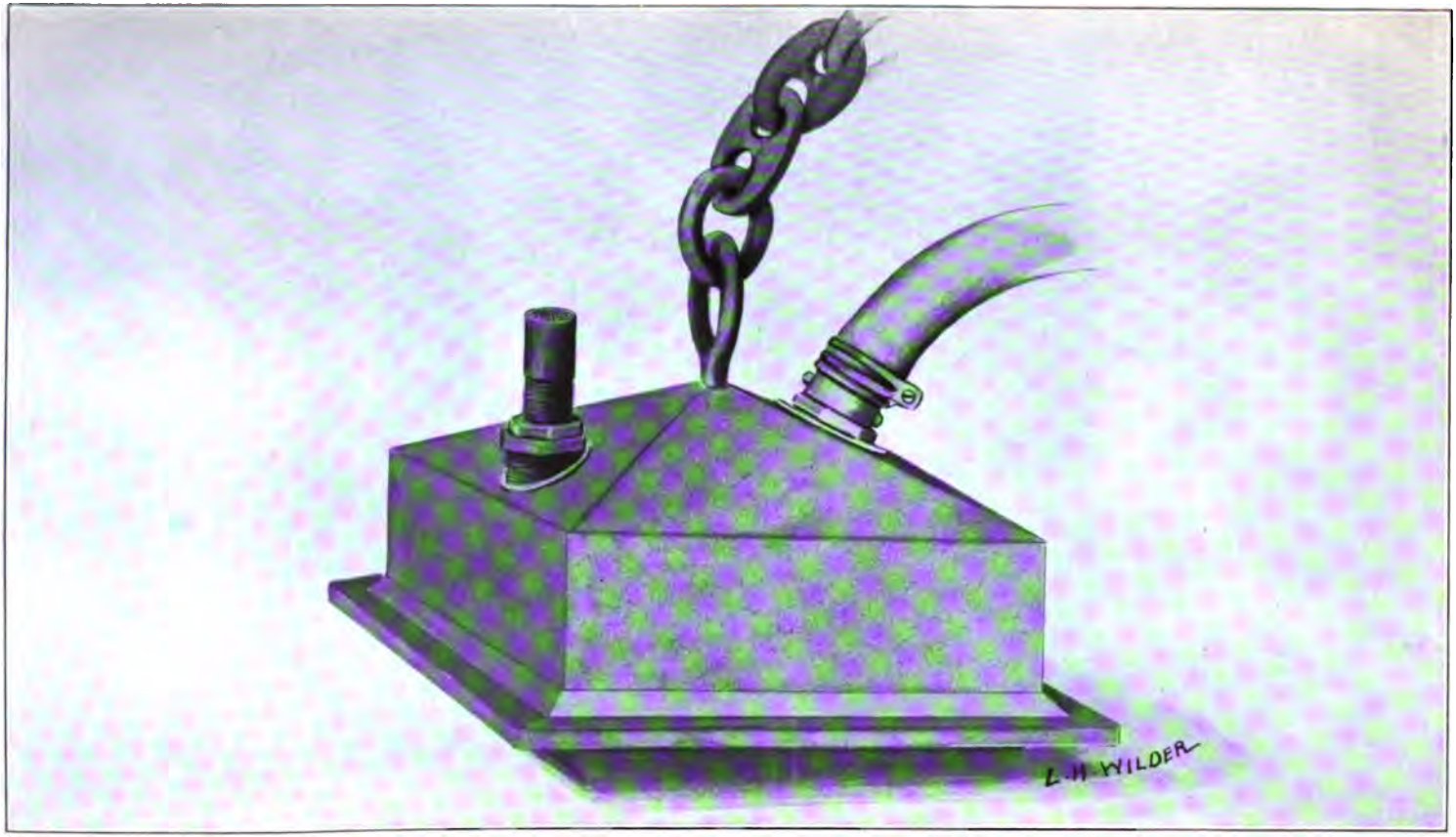

FIG. 14.—APPARATUS FOR THE COLLECTION OF SAMPLES OF MUD (OUTSIDE VIEW).

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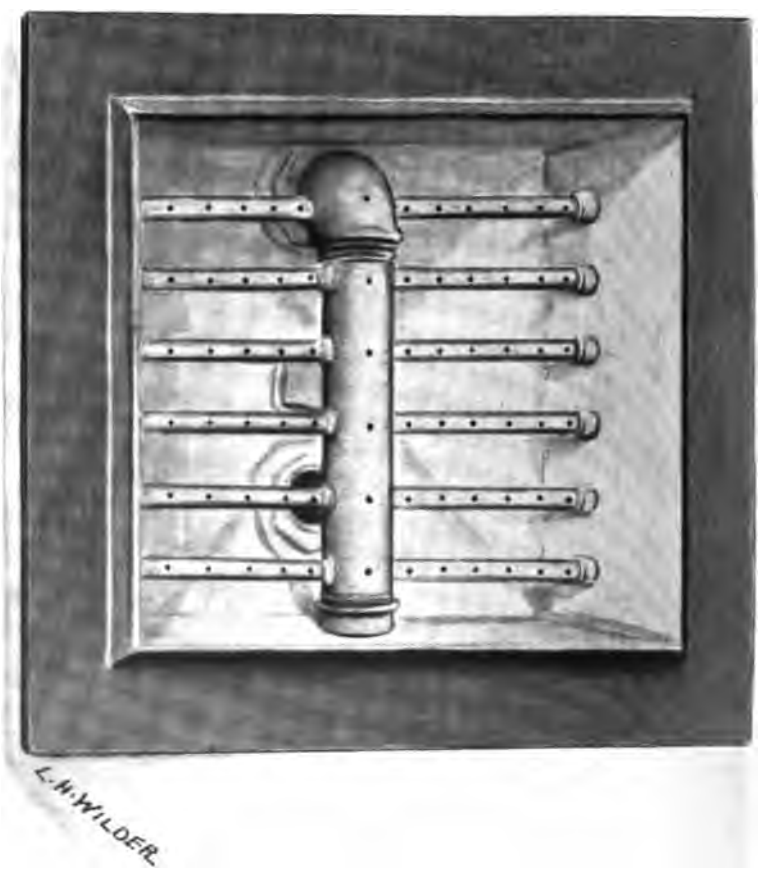

FIG. 15.—APPARATUS FOR THE COLLECTION OF SAMPLES OF MUD (INSIDE VIEW).

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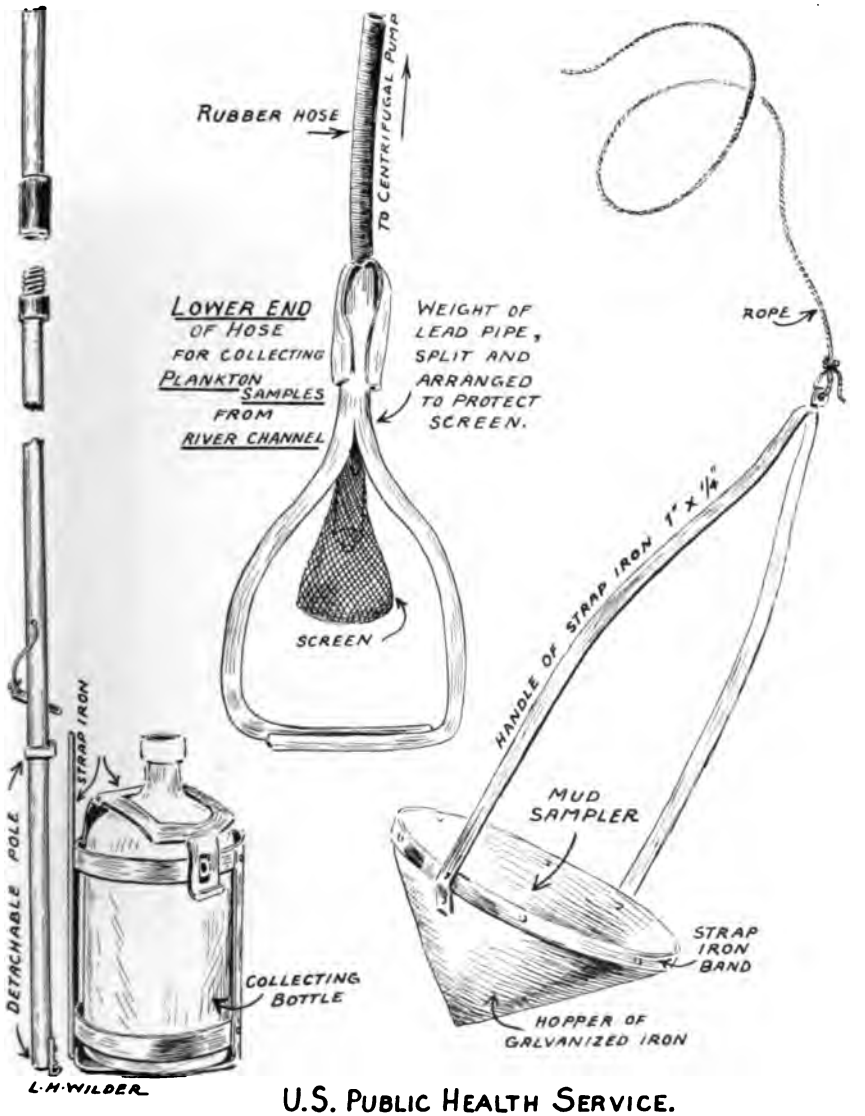

FIG. 16.—APPARATUS USED IN COLLECTING SAMPLES.

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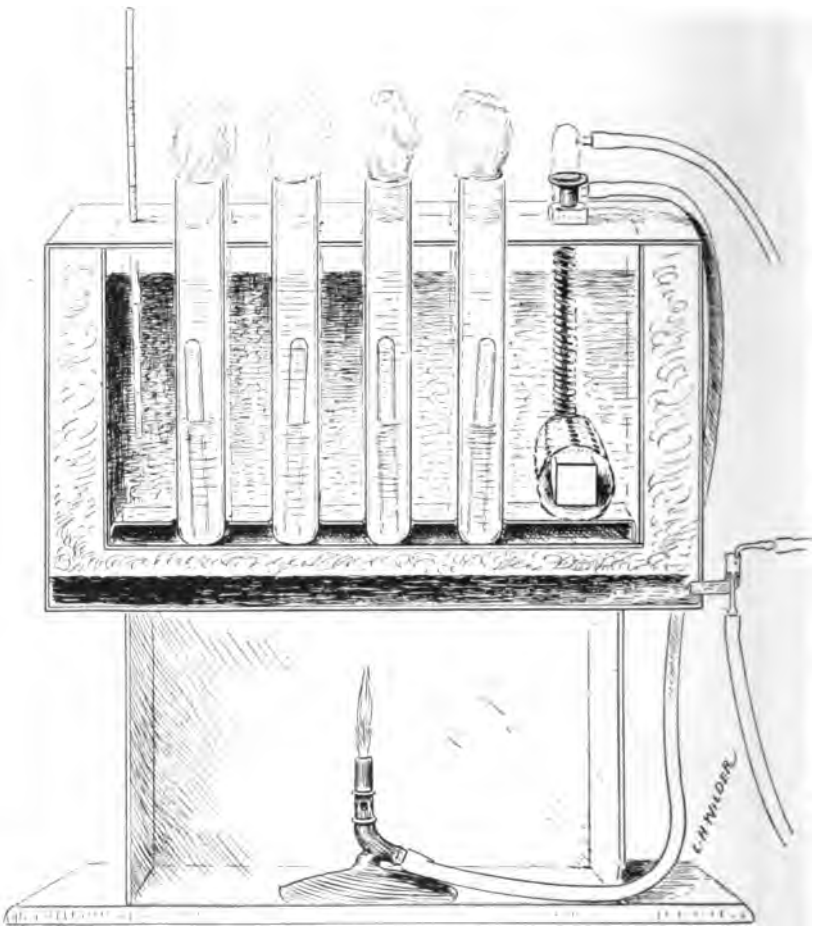

FIG. 17.—APPARATUS DESIGNED AND USED FOR THE ISOLATION OF SPORE-FORMING, LACTOSE-SPLITTING, AND GAS-FORMING ORGANISMS.

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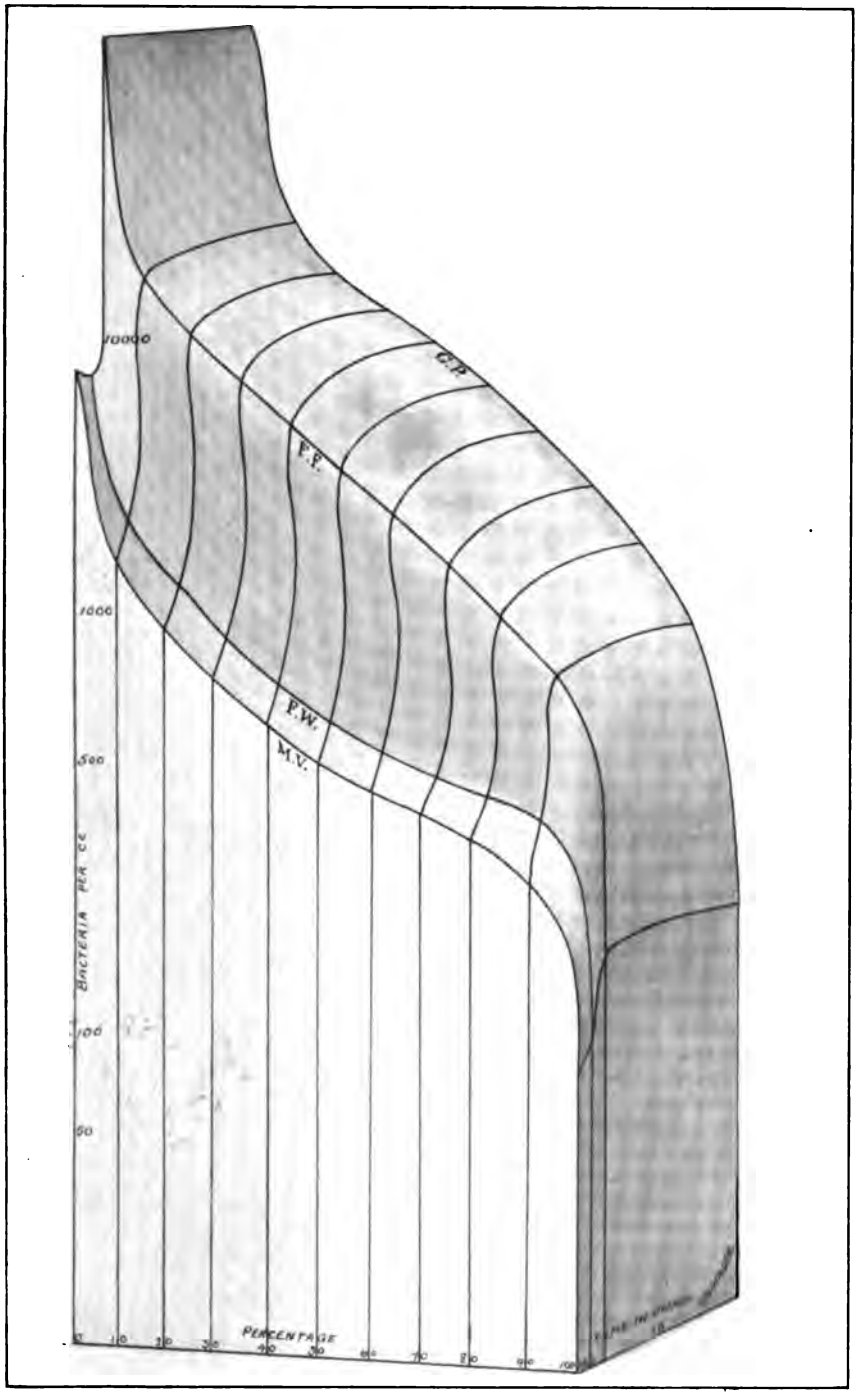

FIG. 18.—SOLID MODEL SHOWING BY QUARTERLY PERIODS THE DISTRIBUTION OF AGAR COUNTS IN RELATION TO STATIONS AND TIME; JUNE, JULY, AND AUGUST.

G. P., Giesboro Point; F. F., Fort Foote; F. W., Fort Washington; M. V., Mount Vernon; M. H., Marshall Hall; W. P., Whitestone Point; I. H., Indian Head; P. P., Possum Point; M. P., Maryland Point; P. C., Popes Creek; L. C. P., Lower Cedar Point; B. L. C. P., Sections below Lower Cedar Point.

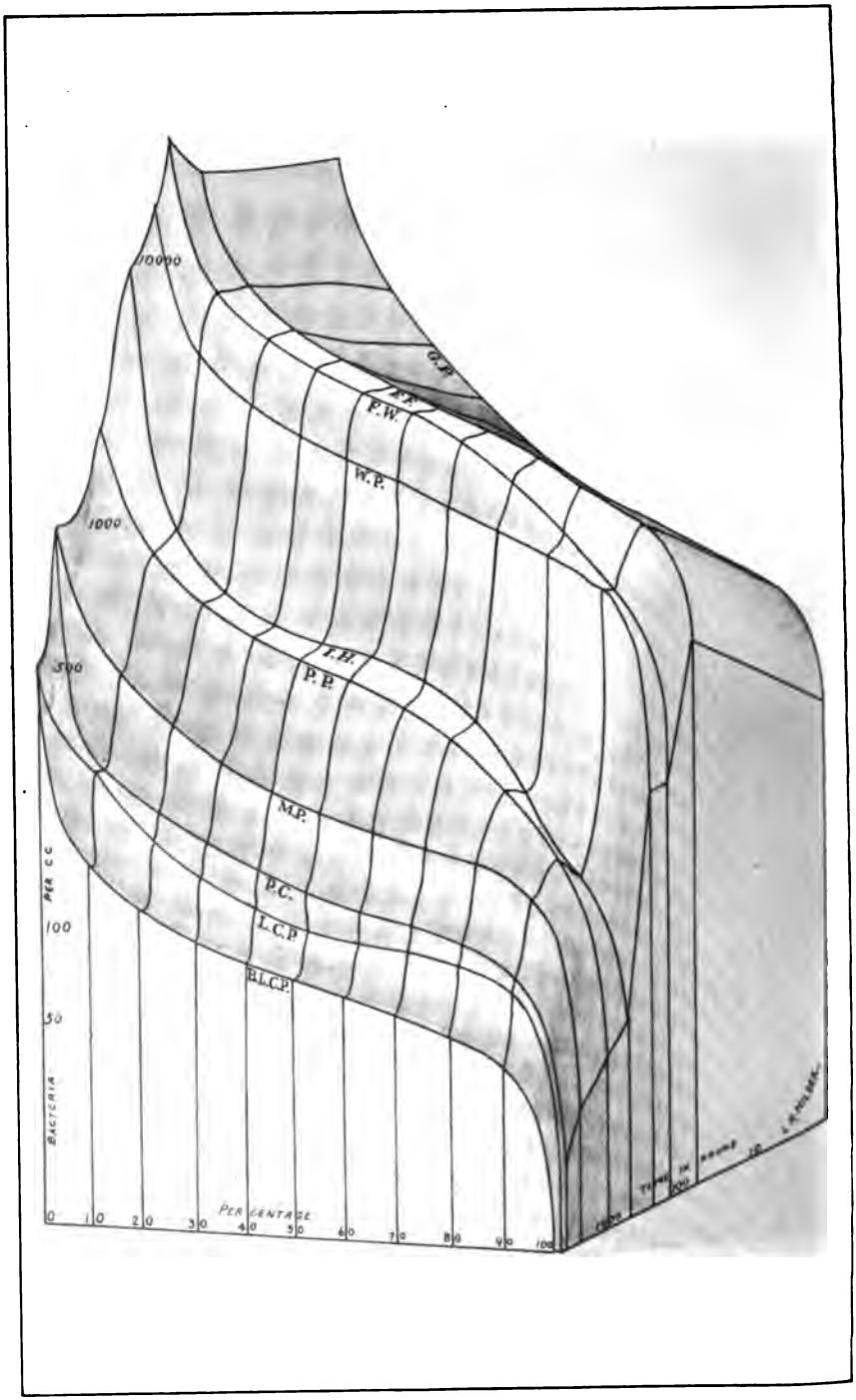

FIG. 21.—SOLID MODEL SHOWING BY QUARTERLY PERIODS THE DISTRIBUTION OF AGAR COUNTS IN RELATION TO STATIONS AND TIME; MARCH, APRIL, AND MAY.

G. P., Giesboro Point; F. F., Fort Foote; F. W., Fort Washington; M. V., Mount Vernon; M. H., Marshall Hall; W. P., Whitestone Point; I. H., Indian Head; P. P., Possum Point; M. P., Maryland Point; P. C., Popes Creek; L. C. P., Lower Cedar Point; B. L. C. P., Sections below Lower Cedar Point.

FIG. 22.—ELODEA CANADENSIS.

FIG. 23.—MYRIOPHYLLUM.

L. H. Wilder.

FIG. 24.—CERATOPHYLLUM (BUDS).

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FIG. 25.—SPIROGYRA ON A BIT OF

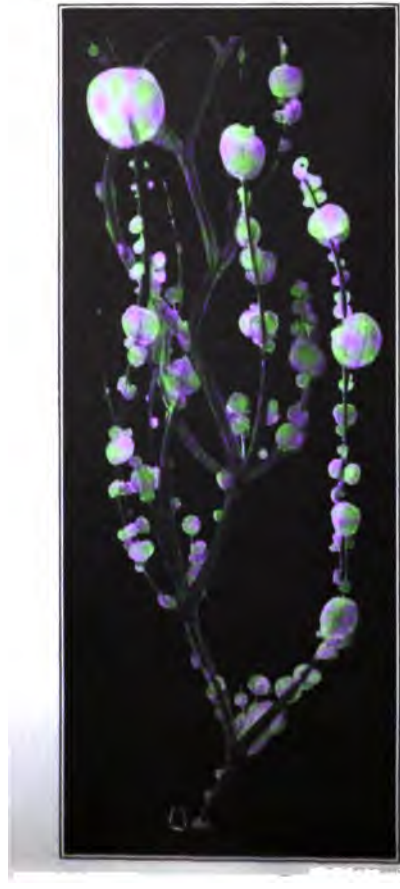
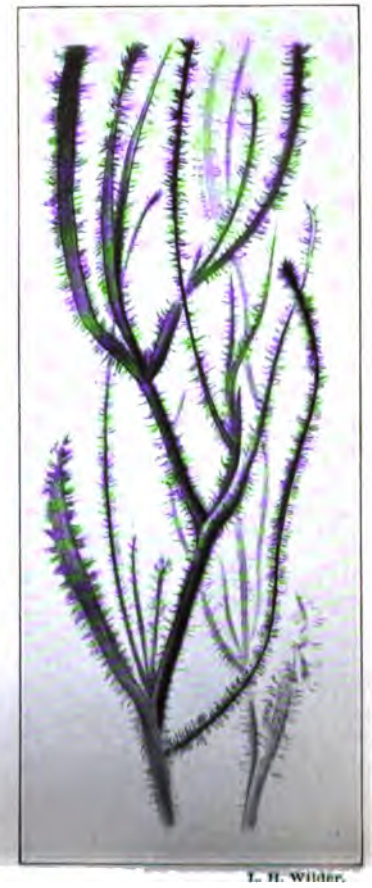


FIG. 26.—RIVULARIA ON POTA-



L. H. Wilder.

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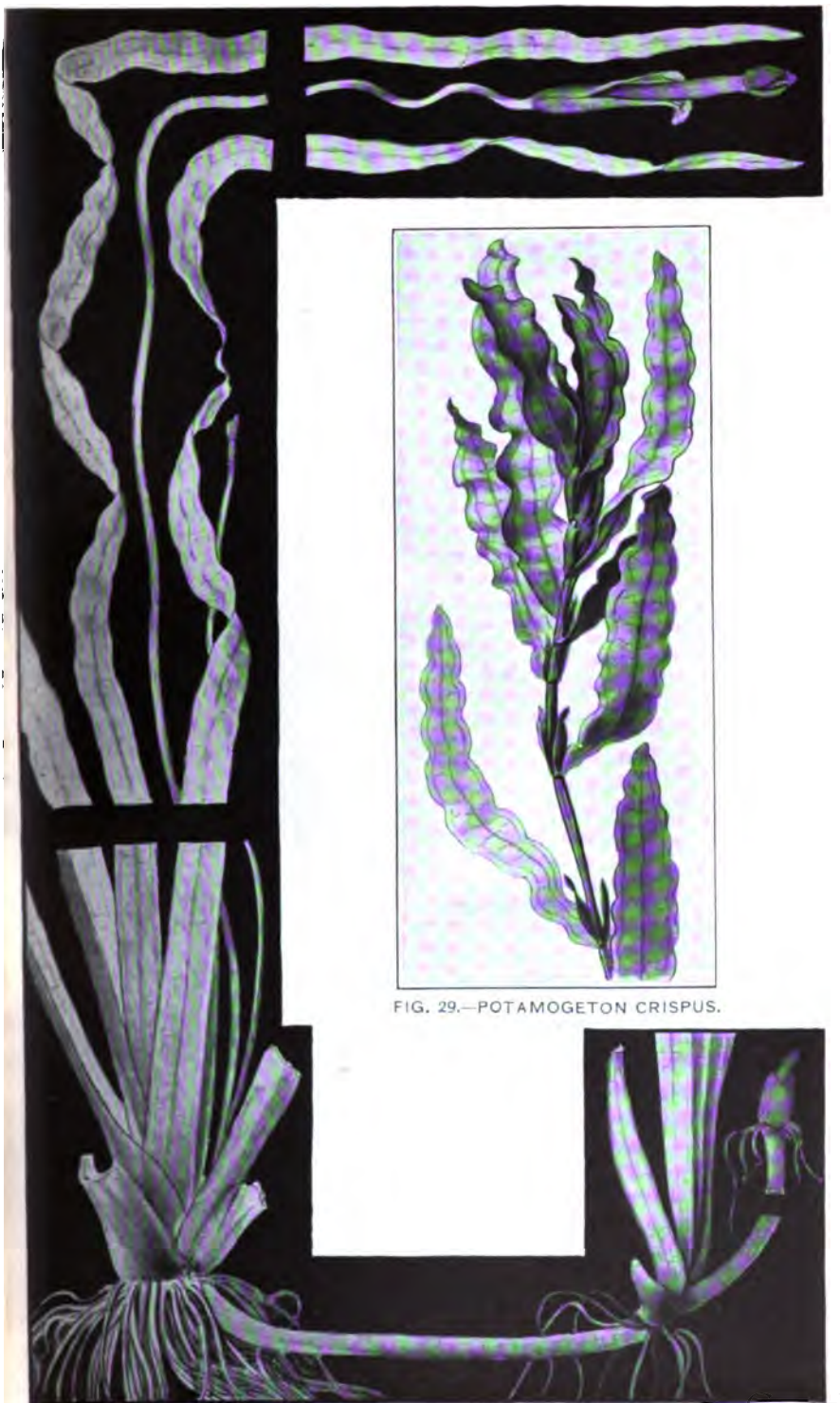

FIG. 29.—POTAMOGETON CRISPUS.

FIG. 28.—VALLISNERIA SPIRALIS (EELGRASS). L. H. Wilder.

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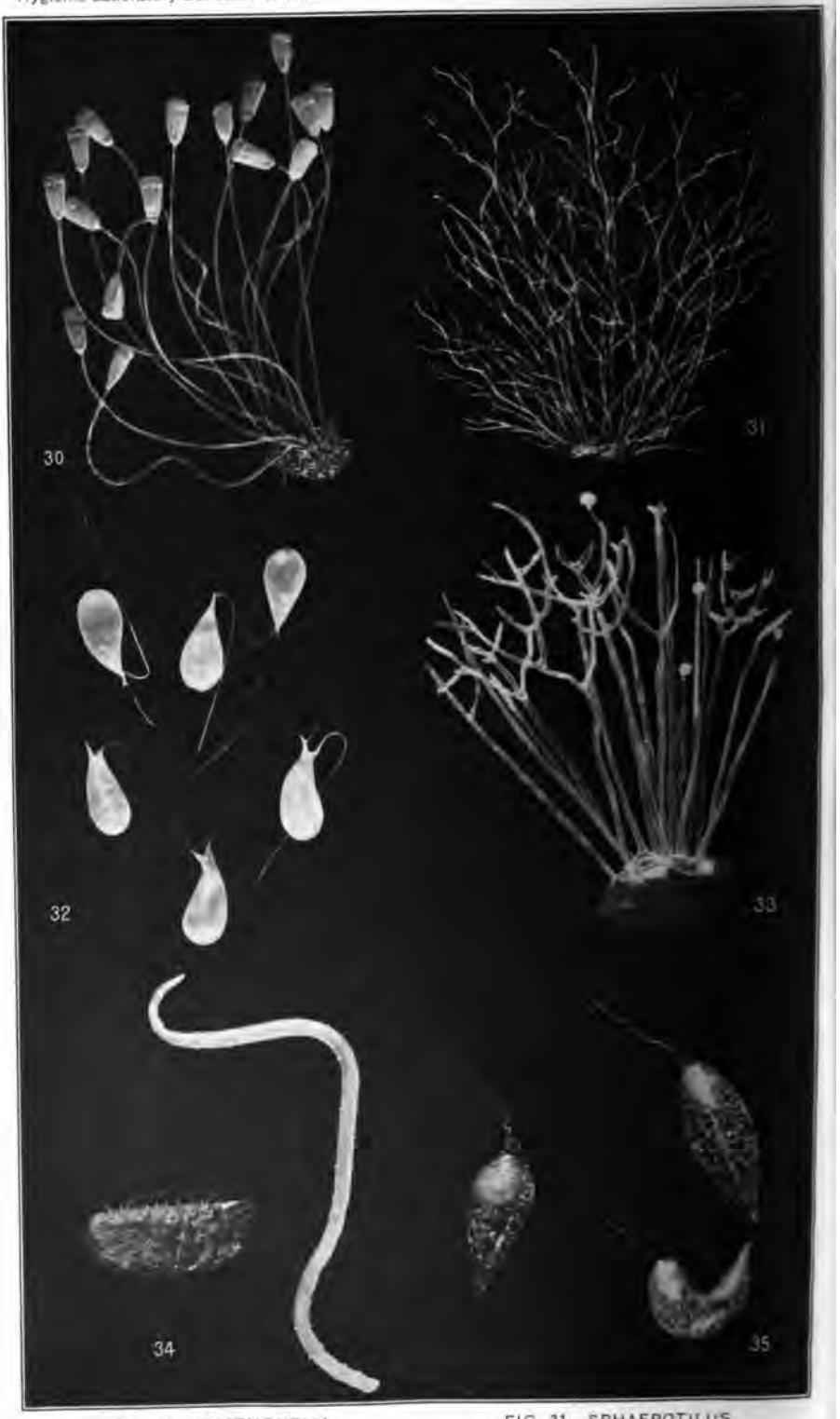

FIG. 30.—GOMPHONEMA.
FIG. 31.—SPHAEROTILUS.
FIG. 32.—BODO SALTANS.
FIG. 33.—SAPROLEGNIA.
FIG. 34.—LIMNODRILUS.
FIG. 35.—EUGLENA.

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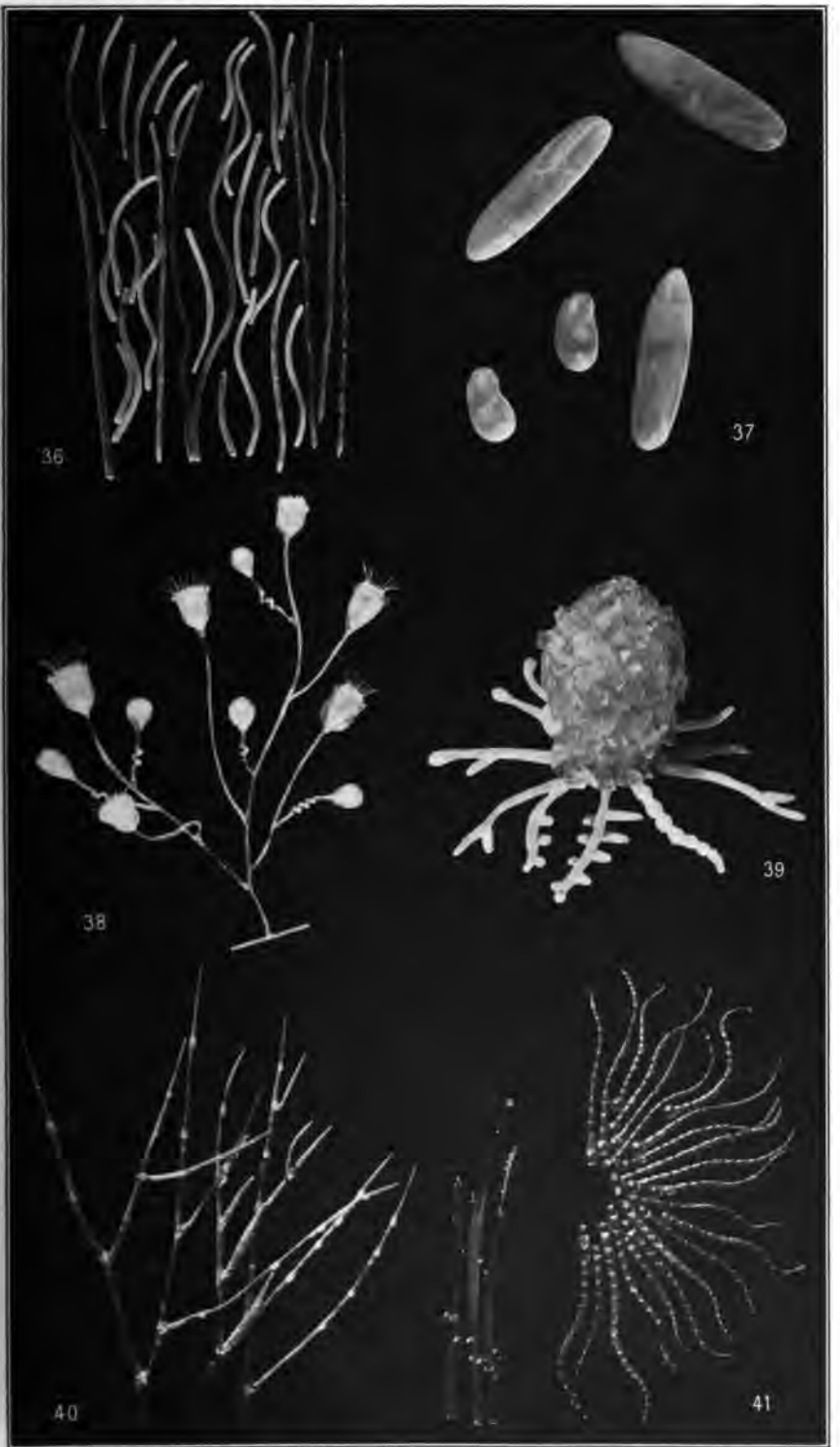

FIG. 36.—BEGGIATOA.
FIG. 37.—PARAMOECIUM AND COLPIDIUM.
FIG. 38.—CARCHESIUM.
FIG. 39.—DIFFLUGIA.
FIG. 40.—CLADOPHORA.
FIG. 41.—RIVULARIA.

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FIG. 42.—VORTICELLA.
FIG. 43.—CYCLOPS.
FIG. 44.—HYDRODICTYON.
FIG. 45.—ANABOENA.
FIG. 46.—STAURASTRUM.
FIG. 47.—PLANARIAN.

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FIG. 48.—ASTERIONELLA.
FIG. 49.—CLOSTERIUM.
FIG. 50.—ARCELLA.
FIG. 51.—SPIROGYRA.
FIG. 52.—OEDOZONIUM.
FIG. 53.—NAVICULA.

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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

HYGIENIC LABORATORY—BULLETIN No. 105
FEBRUARY, 1916

DIGEST OF COMMENTS

ON THE

PHARMACOPŒIA OF THE UNITED STATES OF AMERICA

AND ON THE

NATIONAL FORMULARY

FOR THE CALENDAR YEAR ENDING DECEMBER 31

1914

BY

MARTIN I. WILBERT

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

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PUBLIC HEALTH
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PREFACE.

This bulletin, the tenth of the present series of the Digest of Comments, represents a comprehensive index of the available literature relating to the nature, object, or content of the Pharmacopœia of the United States of America and of the National Formulary, the two books recognized by statute as authoritative standards of the purity and strength of drugs and their preparations.

In this, as in the previous numbers of the Digest of Comments, an effort has been made to give, in as concise a form as practicable, working references to all of the published articles relating in any way to the official standards mentioned above. The available pharmaceutical, medical, and chemical periodicals and reports have been carefully reviewed, and every reference that might prove to be helpful, or even suggestive, has been recorded.

An effort has also been made to reflect in as brief a form as practicable the essential features embodied in the several installments of the Abstract of Proposed Changes, with New Standards and Descriptions, published during the year, with a summary of the comments thereon that have appeared in the pharmaceutical journals. These Abstracts of Proposed Changes, in addition to being printed in the Journal of the American Pharmaceutical Association, were also distributed as separate reprints, and the material contained in the five installments that are reviewed has attracted considerable attention and has been liberally commented upon by pharmacists and others interested in the promulgation of equitable standards for widely used drugs and preparations.

From a pharmaceutical point of view the publication of the fifth edition of the British Pharmacopœia is the event of greatest importance to be recorded for the year 1914.

A point of special interest in connection with the appearance of this book is that it completes the adherence of the several powers signatory to the international treaty of 1906 for the unification of the pharmacopœial formulas for potent medicaments. This Pharmacopœia is also interesting in that the committee having the revision of the book in charge has endeavored to produce a British Pharmacopœia suitable for the whole Empire.

The revised Pharmacopœia was formally adopted by the executive committee of the General Medical Council on July 13, 1914, but final publication was somewhat delayed because of the European war, and

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the book was not placed on exhibition in London until October 1, 1914, when it was advertised to become official on December 31 of the same year.

The medical as well as the pharmaceutical journals of Great Britain, of the several colonies overseas, and of even this country, devoted considerable space to reviews of the book and to discussions of the novel features of this, the fifth edition of the British Pharmacopœia, so that physicians and pharmacists generally were well informed in regard to all of the important changes some weeks before the book was available for general sale.

The second supplement to the fourth edition of the Netherlands Pharmacopœia was published early in 1914, and, like the Pharmacopœia itself, is available both in Latin and in Dutch. In addition to the descriptions for 12 new articles, the pamphlet includes changes in connection with 23 articles already official.

In addition to the publications referred to above, the prospective revisions of the Austrian, the German, and the Italian Pharmacopœias have been productive of many interesting and timely communications that have made restricting the size of this bulletin exceedingly difficult.

As in the preceding numbers of the Digest of Comments, comprehensive discussions or reports are given comparatively little space, the intent being to call attention to the character and scope of the original paper rather than to record its actual content.

In citing references the more available publication is usually given the preference, even in cases where the original article did not appear in the journal first quoted.

For obvious reasons no effort has been made to record all of the journals in which any given paper may have appeared. As an illustration, it may be stated that the papers presented at the annual meetings of the British Pharmaceutical Conference are usually reprinted in all of the British drug journals in addition to the yearbook of the conference itself. To avoid an unnecessarily large number of references, the Pharmaceutical Journal and the yearbook alone are enumerated in this compilation, it being understood that wherever these two references appear conjointly the same article can also be found in the Chemist and Druggist and in the British and Colonial Druggist.

In connection with some few of the more frequently commented-on subjects an effort has been made to reflect the general trend of the comments rather than to record in a comprehensive way all that has been printed during the year. To avoid the repetition of references to subjects more or less related, an attempt has been made in many instances to combine two or more under one heading.

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Comments on the action and uses of drugs are confined to reports of pharmacological investigations and to records of unusual, toxic, or secondary effects of official drugs and preparations.

Further to restrict the size of this bulletin, references to specific sera and vaccines other than those already included in or proposed for inclusion in the Pharmacopœia of the United States have been discontinued because of the practical difficulties encountered in reflecting in a condensed and yet comprehensive way the literature relating to all of the many products that are available or under active discussion.

The political disturbance in European countries has entailed unprecedented conditions in the various activities relating to pharmacopœial revision work. Normal conditions in the medicine-supply business have been seriously interfered with, and the drug and chemical markets of the world will undoubtedly feel the disturbing influence of the present conflict for many years to come. The real seriousness of the problems involved will be felt later even more than now because of the interruption of systematic laboratory work in practically all of the countries of Europe. This effect on future progress is already made evident by the suspension and even the discontinuance of publications of a scientific nature in the several countries involved in the war.

From a medical and pharmaceutical point of view the war may offer some degree of recompense in that it will tend to develop our knowledge of the uses of drugs in the prevention of infections and in the checking of certain diseases.

The public health feature of pharmacopœial work is being more and more emphasized, and in practically all parts of the world greater attention is now devoted to the study of prophylactic measures and the materials that are or may be used in connection therewith.

The possible misuse of drugs in various forms is beginning to attract the attention that is rightfully due it as a causative factor in the comparatively rapid increase of degenerative diseases. In our own country discussions along this line have been largely restricted to the promulgation of measures designed to restrict or to safeguard the sale and use of habit-forming drugs. These discussions have been of assistance in securing the enactment of the Federal antinarcotic law, signed by the President of the United States December 17, 1914. This law is designed to restrict, if not to regulate, the sale and distribution of opium and coca, their alkaloids, salts, and derivatives, and will no doubt go far toward making existing or prospective State and local legislation efficient and enforceable.

In Great Britain a select committee of Parliament in a comprehensive report, prepared after conducting an exhaustive investi-

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gation of the several problems involved, expressed the opinion that the indiscriminate sale of potent drugs in the form of patent or proprietary remedies constitutes a grave and widespread public evil. Many of these remedies are put on the market by ignorant persons or by cunning swindlers who "exploit for their own profit the apparently invincible credulity of the public."

For the purpose of directing attention to some of the existing abuses in connection with the distribution, sale, and use of medicines, an attempt has been made to record the activities of Federal and State laboratories in connection with the enforcement of food and drug laws and also to review at some length the reports from other chemical laboratories in which pharmaceutical investigations were made. This material has been classified and is reported under the several pharmacopœial titles so as to give at a glance a summary of the work actually done or reported during the calendar year.

The general appreciation of the fact that ready-made prescriptions in the form of fixed formula preparations, either official or proprietary, have a tendency to restrict rather than to further the development of scientific medicine is evidenced by the recognition that has been accorded to the list of useful drugs published by the council on pharmacy and chemistry of the American Medical Association.

The ninth revision of the Pharmacopœia of the United States of America and the revised edition of the National Formulary are now in press and will no doubt be ready for distribution before the end of the present calendar year.

In conclusion the compiler desires to extend thanks to the publishers and editors of journals and periodicals furnished in exchange; to the secretaries of State and national pharmaceutical associations for copies of the annual proceedings; to John Uri Lloyd, Cincinnati, for several eclectic medical journals; and to the officers of the library of the Department of Agriculture, the library of the Office of the Surgeon General, Washington, the library of the Philadelphia College of Pharmacy, the library of the Franklin Institute, and the library of the College of Physicians of Philadelphia for the use of reports and periodicals not on file in this laboratory. The compiler also desires to extend thanks to Harold Le Duc for his assistance in preparing the manuscript.

M. I. W.

Division of Pharmacology,
Hygienic Laboratory,
August 17, 1915.

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LIST OF THE LITERATURE REVIEWED.

1. TITLE ABBREVIATIONS—JOURNALS.

Abstr. Prop. Changes.—Abstract of Proposed Changes with New Standards and Descriptions (U. S. P. IX). Parts 2–6—First Proof, 1914.

Am. Druggist.—American Druggist and Pharmaceutical Record, N. Y. v. 62.

Am. Food J.—American Food Journal (The), Chicago, Ill., 1914, v. 9.

Am. J. Clin. Med.—American Journal of Clinical Medicine, 1914, v. 21.

Am. J. M. Sc.—American Journal of the Medical Sciences, Philadelphia, 1914, v. 147, 148.

Am. J. Pharm.—American Journal of Pharmacy, Philadelphia, 1914, v. 86.

Am. J. Physiol.—American Journal of Physiology, Boston, 1914, v. 33, 34, 35.

Am. J. Public Health.—American Journal of Public Health, 1914, v. 4.

Am. J. Sc.—American Journal of Science, New Haven, 1914, v. 187, 188.

Am. Med.—American Medicine, 1914, v. 20.

Am. Perf.—The American Perfumer and Essential Oil Review, N. Y., 1914, v. 9.

Am. Vet. Rev.—American Veterinary Review, New York, 1914, v. 44, 45, 46.

Analyst (The), London, 1914, v. 39.

Ann. Bot.—Annals of Botany, London, 1914, v. 28.

Ann. Chem.—Justus Liebig's Annalen der Chemie, Leipzig, 1914, v. 402–406.

Ann. chim. analyt.—Annales de chimie analytique, Paris, 1914, v. 19.

Ann. chim. applicata.—Annali de chimica applicata, Roma, 1914, v. 1, 2.

Ann. chim. Paris.—Annales de chimie, Paris, 1914, v. 1, 2.

Ann. Falsif.—Annales de falsifications, Paris, 1914, v. 7.

Ann. Pharm. Louvain.—Annales de Pharmacie, Louvain, 1914, v. 20, Nos. 1–5.

Ann. Phys. Paris.—Annales de Physique, Paris, 1914, v. 1, 2.

Ann. Rep. Southall Bros. & Barclay, 1914.—Annual Report, Southall Bros. & Barclay, 1914. Twenty-second and twenty-third annual reports, 1913–14, Birmingham, 1915.

Ann. Rep. Therap. Res. Com.—Annual Report of Investigations of the Therapeutic Research Committee of the Council on Pharmacy and Chemistry of the American Medical Association, 1914, v. 3, Chicago, 1915.

Apothecary (The), Boston, 1914, v. 26.

Apoth.-Ztg.—Apotheker-Zeitung, Berlin, 1914, v. 29.

Arb. k. Gsndhtsamte.—Arbeiten aus dem kaiserlichen Gesundheitsamte, Berlin, 1914, v. 47, 48, 49.

Arb. pharm. Inst. Univ. Berl.—Arbeiten aus dem pharmazeutischen Institut der Universität, Berlin, 1914, v. 11.

Arch. Chem. Mikros.—Archiv für Chemie und Mikroskopie, 1914, v. 7.

Arch. exper. Path. u. Pharmakol.—Archiv für experimentelle Pathologie und Pharmakologie, 1914, v. 74, 75, 76, 77, 78, Nos. 1 and 2.

Arch. farmacol. sper.—Archivio di farmacologia sperimentale e Scienze affini, Sienna, 1914, v. 17, 18.

Arch. ges. Physiol.—Pflüger's Archiv für die gesamte Physiologie des Menschen und der Thiere, 1914, v. 156, 157, 158, 159.

Arch. Hyg.—Archiv für Hygiene, 1914, v. 82, 83.

Arch. Internat. pharmacod. et thérap.—Archives internationales de pharmacodynamie et de thérapie, Brussels and Paris, 1914, v. 24, Nos. 1 and 2.

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Arch. Int. Med.—Archives (The) of Internal Medicine, Chicago, 1914, v. 13, 14.
Arch. Pharm.—Archiv der Pharmazie, Berlin, 1914, v. 252.
Arch. Pharm. og Chem. Copenhagen.—Archiv for Pharmaci og Chemi, Copenhagen, 1914, v. 21.
Atti accad. Lincei.—Atti della reale accademie dei Lincei, 1914, v. 23.
Australas. J. Pharm.—Australasian Journal of Pharmacy, Melbourne, 1914, v. 29.
Beihefte zum Tropenpflanzer, 1914, v. 15, Nos. 1–5.
Ber. deutsch. chem. Gesellasch.—Berichte der deutschen chemischen Gesellschaft, Berlin, 1914, v. 47.
Ber. deutsch. pharm. Gesellsch.—Berichte der deutschen pharmazeutischen Gesellschaft, Berlin, 1914, v. 24.
Berl. klin. Wchnschr.—Berliner klinische Wochenschrift, 1914, v. 51.
Biochem. Bull.—Biochemical Bulletin, N. Y. Columbia University Biochemical Society, 1914, v. 3.
Biochem. J.—Biochemical Journal, Liverpool, 1914, v. 8.
Biochem. Ztschr.—Biochemische Zeitschrift, Berlin, 1914, v. 58–67.
Boll. chim.-farm.—Bolletino Chimico-Farmaceutico, Milan, 1914, v. 53.
Boston M. & S. J.—Boston Medical and Surgical Journal, 1914, v. 170, 171.
Bot. Gaz.—Botanical Gazette, Chicago, 1914, v. 57, 58.
Brit. & Col. Drug.—British and Colonial Druggist, London, 1914, v. 65–66.
Brit. Food J.—British Food Journal, London, 1914, v. 16.
Brit. M. J.—British Medical Journal, London, 1914, v. 1, 2.
Bull. Agric. Com. Ohio.—Bulletin of the Agricultural Commission of Ohio, Dairy and Food Division, Bureau of Drugs, 1914, No. 2.
Bull. Assoc. Gén. Syn. Pharm. France.—Bulletin de l'Association Générale des Syndicats Pharmaceutiques de France, 1914, v. 6, Nos. 1–8.
Bull. Bur. Standards.—Bulletin of the Bureau of Standards, Department of Commerce, 1914, v. 10, 11, No. 1.
Bull. California Bd. Health.—Monthly Bulletin, California State Board of Health, 1914, v. 10.
Bull. gén. Therap.—Bulletin général de Therapeutique, Paris, 1914, v. 167, 168, Nos. 1–4.
Bull. Georgia Dept. Agric.—Bulletin, Georgia Department of Agriculture, 1914, No. 66.
Bull. Hyg. Lab.—Bulletins, Hygienic Laboratory, U. S. Public Health Service, Nos. 92–100.
Bull. Imp. Inst.—Bulletin of the Imperial Institute, London, 1914, v. 12.
Bull. Indiana Bd. Health.—Monthly Bulletin of the Indiana State Board of Health, 1914.
Bull. Int. Repr. Fraudes.—Bulletin Internationale de la Repression des Fraudes, 1914, v. 7.
Bull. Kansas Bd. Health.—Bulletin, Kansas State Board of Health, 1914, v. 10.
Bull. Kentucky Agric. Exper. Sta.—Bulletin, Kentucky Agricultural Experiment Station, 1914.
Bull. Lab. Inl. Rev. Dept. Canada.—Bulletins of the Laboratory of the Inland Revenue Department, Ottawa, Canada, 1914.
Bull. Louisiana Bd. Health.—Quarterly Bulletin of the Louisiana State Board of Health, 1914, v. 5.
Bull. Massachusetts Bd. Health.—Bulletin Massachusetts State Board of Health, 1914, v. 9.
Bull. Michigan D. & F. Dept.—Bulletin Michigan Dairy & Food Department, 1914, Nos. 220–231.

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Bull. Missouri Bot. Gard.—Bulletin Missouri Botanical Garden, St. Louis, 1914, v. 2.

Bull. Missouri F. & D. Dept.—Bulletin of the Food and Drug Department, Missouri, 1914, v. 6.

Bull. New Hampshire Bd. Health.—Quarterly Bulletin of the State Board of Health of New Hampshire, 1914, v. 3.

Bull. North Carolina Bd. Health.—Bulletin of the North Carolina Board of Health, 1914, v. 29.

Bull. North Dakota Bd. Health.—Bulletin of the North Dakota State Board of Health, 1914, v. 7.

Bull. North Dakota Exper. Sta. F. Dept.—Bulletin (Special) of the Food Department of the North Dakota Agricultural Experiment Station, 1914, v. 3.

Bull. Ohio Bd. Health.—Bulletin (Monthly) of the Ohio State Board of Health, 1914, v. 4.

Bull. Pennsylvania D. & F. Div.—Monthly Bulletin of the Dairy and Food Division of the Pennsylvania Department of Agriculture, 1914, v. 12.

Bull. Pharm.—Bulletin of Pharmacy, Detroit, 1914, v. 28.

Bull. pharm. sud-est.—Bulletin de Pharmacie dé Sud-Est, Montpellier, 1914, v. 19, Nos. 1–6.

Bull. Rhode Island Bd. Health.—The Health Bulletin of the Rhode Island State Board of Health, 1914.

Bull. sc. pharmacol.—Bulletin des Sciences Pharmacologiques, Paris, 1914, v. 21.

Bull. Soc. Chim. Belg.—Bulletin de la Société Chimique de Belgique, Gand, 1914, v. 28, Nos. 1–7.

Bull. Soc. chim. France.—Bulletin de la Société de France, Paris, 1914, v. 15, 16.

Bull. Soc. pharm. Bordeaux.—Bulletin des travaux de la Société de Pharmacie de Bordeaux, 1914, v. 54.

Bull. Soc. scient. et med. l'ouest.—Bulletin de la Société scientifique et médicale de l'ouest, Rennes, 1914, v. 23, No. 1.

Bull. South Dakota F. & D. Dept.—Bulletin, South Dakota Food and Drug Department, 1914.

Bull. Tennessee F. & D. Dept.—Bulletin, South Dakota Food and Drug Department, 1914, v. 1, No. 1–3.

Bull. Torrey Bot. Club.—Bulletin of the Torrey Botanical Club, New York, 1914, v. 41.

Bull. U. S. Dept. Agric.—Bulletin of the U. S. Department of Agriculture, 1914.

Bull. Vermont Bd. Health.—Bulletin of the Vermont State Board of Health, 1914.

Bull. Virginia D. & F. Com.—Bulletin of the Dairy and Food Commissioner of Virginia, 1914, Nos. 39, 40, 41.

Bull. Washington Bd. Health.—Quarterly Bulletin of the Washington State Board of Health, 1914, v. 4.

Bull. West Virginia Bd. Health.—Quarterly Bulletin of the West Virginia State Board of Health, 1914.

Bull. Wisconsin Univ.—Bulletin of the University of Wisconsin, Serial No. 738, General Series No. 542, 1914.

Bull. Wyoming D. & F. Dept.—Bulletin of Analyses, Wyoming Dairy, Food and Oil Department, 1914.

Canadian Drug.—Canadian Druggist, Toronto, 1914, v. 26.

Canadian Pharm. J.—Canadian Pharmaceutical Journal, Toronto, 1914, v. 47, Nos. 6–12, v. 48, Nos. 1, 2.

Chem. Abstr.—Chemical Abstracts, Easton, 1914, v. 8.

Chem. & Drug.—Chemist and Druggist, London, 1914, v. 84, 85.

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Chem. & Drug. Australas.—Chemist and Druggist of Australasia, Sydney and Melbourne, 1914, v. 29.
Chem. Eng.—Chemical Engineer, Chicago, 1914, v. 19–20.
Chem. Eng. & Works Chem.—Chemical Engineering and the Works Chemist, Dover, 1914, v. 4.
Chem. Ind.—Chemische Industrie, Berlin, 1914, v. 37.
Chem. News.—Chemical News, London, 1914, v. 109, 110.
Chem. Repert.—Chemisch Technisches Repertorium, Cöthen, 1914, v. 38.
Chem. Rev. Fett u. Harz Ind.—Chemische Revue über die Fett und Harz Industrie, 1914, v. 21.
Chem. Weekblad.—Chemisch Weekblad, Amsterdam, 1914, v. 11.
Chem. World.—Chemical World, 1914, v. 3.
Chem. Zentralbl.—Chemisches Zentralblatt, Berlin, 1914, v. 85.
Chem.-Ztg.—Chemiker Zeitung, Cöthen, 1914, v. 38.
Chem. Ztschr.—Chemische Zeitschrift, Berlin, 1914, v. 13.
Circ. Bur. Stand.—Circulars Bureau of Standards, U. S. Department of Commerce, 1914.
Circ. Kentucky Exper. Sta. F. & D. Div.—Circulars Food and Drug Division, Kentucky Agricultural Experiment Station, 1914.
Compt. rend. Acad. sc.—Comptes rendus hebdomadaires des séances de l'Academie des sciences, Paris, 1914, v. 158, 159.
Compt. rend. Congr. Internat. Pharm.—Compte rendu de XI^me^ Congrès Internationale de Pharmacie, La Haye, 1913 [1914], v. 1 and 2.
Compt. rend. Soc. biol.—Comptes rendus des séances et mémoires de la Société de biologie, Paris, 1914, v. 76, 77.
Critic and Guide, New York, 1914, v. 17.
D.-A. Apoth.-Ztg.—Deutsch-Amerikanische Apotheker-Zeitung, New York, 1914, v. 35.
Dental Cosmos, Philadelphia, 1914, v. 56.
Dental Digest (The), New York, 1914, v. 20.
Dept. Com. Bur. Stand. Sc. Papers.—Department of Commerce, Bureau of Standards, Scientific Papers, No. 221, 1914.
Deutsch. med. Wchnschr.—Deutsche medizinische Wochenschrift, Berlin, 1914, v. 40.
Drug. Circ.—Druggists Circular, New York, 1914, v. 58.
Drugs, Oils & Paints, Philadelphia, 1914, v. 29, 30.
Drug Topics, New York, 1914, v. 29.
Eclectic M. J.—Eclectic Medical Journal, Cincinnati, 1914, v. 74.
Ellingwood's Therap.—Ellingwood's Therapeutist, Boston, 1914, v. 8.
Ergeb. Physiol.—Ergenbnisse der Physiologie, Wiesbaden, 1914, v. 14.
Evans' An. Notes.—Evans' Analytical Notes for 1914, No. 8.
Exper. Sta. Record.—Experiment Station Record, U. S. Department of Agriculture, 1914, v. 30, 31.
Farm. Espan.—La Farmacia Espanola, Madrid, 1914, v. 46.
Fortschr. Chem.—Fortschritte der Chemie, Physik und Physikalischen Chemie, Leipzig, 1914, v. 9, 10.
Gaz. Chim. Ital.—Gazzetta chimica Italiana, Roma, 1914, v. 44, part 1, 2,
Hahnemann. Month.—Hahnemannian Monthly, Philadelphia, 1914, v. 49.
Handelsbericht, Gehe & Co., Dresden, 1914.
Hyg. Rundschau.—Hygienische Rundschau, Berlin, 1914, v. 24.
Index Med.—Index Medicus, Washington, 1914, v. 12.
Internat. Ztschr. physikal.-chem. Biol.—Internationale Zeitschrift für physikalische-chemische Biologie, Leipzig u. Berlin, 1914, v. 1.

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J. Adv. Therap.—Journal (The) of Advanced Therapeutics, New York, 1914, v. 32.
J. Agric. Research.—Journal of Agricultural Research, 1914, v. 1, 2, 3.
J. Agric. trop.—Journal d'Agriculture tropicale, 1914, v. 14, Nos. 1–7.
Jahres-Ber.—Jahres-Bericht von Caesar & Loretz, Halle a. S., 1914.
Jahresber. Pharm.—Jahresbericht der Pharmazie, 1913, Göttingen, 1914, v. 48.
J. Am. Chem. Soc.—Journal of the American Chemical Society, Easton, 1914, v. 36.
J. Am. Inst. Homœop.—Journal of the American Institute of Homœopathy, N. Y., 1914, v. 7.
J. Am. M. Assoc.—Journal of the American Medical Association, Chicago, 1914, v. 62, 63.
J. Am. Pharm. Assoc.—Journal of the American Pharmaceutical Association, Columbus, 1914, v. 3.
J. Biol. Chem.—Journal of Biological Chemistry, New York, 1914, v. 17–19.
J. Chem. Soc. Lond.—Journal of the Chemical Society, London, 1914, v. 105, 106.
J. chim. phys.—Journal de chimie physique, Genève et Paris, 1914, v. 12.
J. Exper. M.—Journal of Experimental Medicine, New York, 1914, v. 19, 20.
J. Franklin Institute.—Journal (The) of the Franklin Institute, Philadelphia, 1914, v. 177, 178.
J. H. Hosp. Bull.—Johns (The) Hopkins Hospital Bulletin, Baltimore, 1914, v. 25.
J. Hyg.—Journal (The) of Hygiene, Cambridge, 1914, v. 14.
J. Ind. & Eng. Chem.—Journal (The) of Industrial and Engineering Chemistry, Easton, 1914, v. 6.
J. Infec. Dis.—Journal (The) of Infectious Diseases, Chicago, 1914, v. 14.
J. Jamaica Agric. Soc.—Journal (The) of the Jamaica Agricultural Society, 1914, v. 18.
J. Linnean Soc. Bot.—Journal of the Linnean Society, Botany, 1914, v. 42, Nos. 285, 286.
J. Med. Research.—Journal of Medical Research, Boston, 1914, v. 30, 31.
J. Pharmacol. & Exper. Therap.—Journal of Pharmacology and Experimental Therapeutics, Baltimore, 1914, v. 6.
J. Pharm. Elsass-Lothr.—Journal der Pharmacie von Elsass-Lothringen, 1914, v. 41.
J. pharm. Anvers.—Journal de pharmacie d'Anvers, 1914, v. 70, Nos. 1–14.
J. pharm. et chim.—Journal de pharmacie et de chimie, Paris, 1914, v. 9, 10.
J. Pharm. Soc. Japan.—Yakugakuzasshi (Journal of the Pharmaceutical Society of Japan) 1914.
J. Phys. Chem.—Journal (The) of Physical Chemistry, Ithaca, 1914, v. 18.
J. physiol. et path. gén.—Journal de physiologie et de pathologie générale, Paris, 1914, v. 16, Nos. 1–4.
J. prakt. Chem.—Journal für praktische Chemie, Leipzig, 1914, v. 89, 90.
J. Proc. Roy. Soc. New South Wales.—Journal and Proceedings of the Royal Society of New South Wales, Sydney, 1914, v. 48.
J. Roy. Micros. Soc.—Journal of the Royal Microscopical Society, 1914, Nos. 218–223.
J. Roy. Soc. Arts.—Journal of the Royal Society of Arts, London, 1914, v. 62.
J. Soc. Chem. Ind.—Journal of the Society of Chemical Industry, London, 1914, v. 33.
J. Washington Acad.—Journal of the Washington Academy of Sciences, 1914, v. 4.

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Kolloid-Ztschr.—Kolloid-Zeitschrift. Zeitschrift für wissenschaftliche und technische Kolloidchemie (früher Zeitschrift für Chemie und Industrie der Kolloide) 1914, v. 14, 15, Nos. 1–4.
Lancet (The), London, 1914, v. 186, 187.
Lilly Sci. Bull.—Lilly (The) Scientific Bulletin, 1914, series 1.
Med. Rec.—Medical Record, New York, 1914, v. 85, 86.
Merck's Ann. Rep.—Merck's Annual Report, 1913, Darmstadt, 1914, v. 27.
Merck's Arch.—Merck's Archives, New York, 1914, v. 16.
Merck's Rep.—Merck's Report, New York, 1914, v. 23.
Meyer Bros. Drug.—Meyer Brothers Druggist, St. Louis, 1914, v. 35.
Midl. Drug.—Midland Druggist and Pharmaceutical Review, Columbus, 1914, v. 48.
Mitt. Lebensm. Hyg.—Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene veröffentlicht vom Schweizerischen Gesundheitsamt, Bern, 1914, v. 5.
Monatsh. Chem.—Monatshefte für Chemie, Vienna, 1914, v. 35.
Month. Bull. Georgia Dept. Agric.—Monthly Bulletin of the Georgia Department of Agriculture, Food and Drugs, 1914, v. 1.
Montreal Pharm. J.—Montreal Pharmaceutical Journal, 1914, v. 25.
Münch. med. Wchnschr. 1914.—Münchener medizinische Wochenschrift, 1914, v. 59.
N. A. R. D. Notes.—The Journal of the National Association of Retail Druggists, Chicago, 1914, v. 17, 18, 19.
Nat. Druggist.—National (The) Druggist, St. Louis, 1914, v. 44.
Nat. Eclect. M. Assoc. Quart.—The National Eclectic Medical Association Quarterly, Cincinnati, 1914, v. 5, 6.
National Drug Clerk (The), 1914, v. 2.
Nature, London, 1914, v. 92, 93, 94.
New Idea (The), Detroit, 1914, v. 36.
New York M. J.—New York Medical Journal, 1914, v. 99, 100.
Norges Apotek. Tidsskr.—Norges Apotekerforenings Tidsskrift, Kristiania, 1914, v. 22.
Northwestern Druggist (The), Minneapolis, 1914, v. 15.
Notices of Judgment, U. S. Department of Agriculture, 1914.
Nouv. remèdes.—Les Nouveaux Remèdes, Paris, 1914, v. 31.
Oesterr. Chem.-Ztg.—Oesterreichische Chemiker-Zeitung, Wien, 1914, v. 17.
Oesterr. Sanitätswesen.—Das Osterreichische Sanitätswesen, Wien, 1914, v. 26.
Off. Insp. Maine Agric. Exper. Sta.—Official Inspections Maine Agricultural Experiment Station, 1913, No. 48, 1914, No. 61.
Oil, Paint & Drug Rep.—Oil, Paint and Drug Reporter, New York, 1914, v. 85, 86.
Pacific Drug Rev.—Pacific (The) Drug Review, Portland, 1914, v. 26.
Pacific Pharm.—Pacific (The) Pharmacist, San Francisco, 1914, v. 7, 9.
Perf. & Ess. Oil Rec.—Perfumery and Essential Oil Record, London, 1914, v. 5.
Pflanzer (Der), Tanga, 1914, v. 10, Nos. 1–5.
Pharm. Era.—Pharmaceutical (The) Era, New York, 1914, v. 47.
Pharm. J.—Pharmaceutical (The) Journal, London, 1914, v. 92, 93.
Pharm. Post.—Pharmazeutische Post, Vienna, 1914, v. 47.
Pharm. Praxis.—Pharmazeutische Praxis, Vienna and Leipzig, 1914, v. 12, Nos. 10–12.
Pharm. Presse.—Pharmazeutische Presse, Vienna, 1914, v. 19.
Pharm. Weekblad.—Pharmaceutisch Weekblad, Amsterdam, 1914, v. 51.
Pharm. Zentralh.—Pharmazeutische Zentralhalle für Deutschland, Dresden, 1914, v. 55.

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Pharm. Ztg.—Pharmazeutische Zeitung, Berlin, 1914, v. 59.
Philippine J. Sc.—Philippine (The) Journal of Science, Manila, 1914, v. 9. A. B. C. D.
Phil. Mag.—The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, 1914, v. 27, 28.
Phys. Drug News.—Physicians' Drug News, Newark, 1914, v. 9.
Physikal. Ztschr.—Physikalische Zeitschrift, Leipzig, 1914, v. 15.
Plant World (The). Baltimore, 1914, v. 17.
Pop. Sci. Monthly.—Popular (The) Science Monthly, 1914, v. 84, 85.
Pract. Drug.—Practical (The) Druggist and Pharmaceutical Review of Reviews, New York, 1914, v. 32.
Practitioner (The), London, 1914, v. 92, 93.
Prescriber (The), London, 1914, v. 8.
Proc. Am. Acad.—Proceedings of the American Academy of Arts and Sciences, 1914, v. 50.
Proc. Am. Philosph. Soc.—Proceedings of the American Philosophical Society, Philadelphia, 1914, v. 53.
Proc. Chem. Soc.—Proceedings of the Chemical Society, London, 1914, v. 30.
Proc. N. A. M. M. P.—Proceedings of the National Association of Manufacturers of Medicinal Products, 1914.
Proc. N. W. D. A.—Proceedings of the National Wholesale Druggists' Association, New York, 1914.
Proc. Roy. Soc. Lond.—Proceedings of the Royal Society, London, 1914, v. 89, 90, 91.
Proc. Roy. Soc. Med. Therap. & Pharmacol. Sec.—Proceedings of the Royal Society of Medicine, Therapeutic and Pharmacologic Section, 1914, v. 7.
Proceedings of State pharmaceutical associations:
Proc. California Pharm. Assoc. 1914.
Proc. Colorado Pharm. Assoc. 1914.
Proc. Florida Pharm. Assoc. 1914.
Proc. Georgia Pharm. Assoc. 1914.
Proc. Idaho Pharm. Assoc. 1914.
Proc. Illinois Pharm. Assoc. 1914.
Proc. Indiana Pharm. Assoc. 1914.
Proc. Iowa Pharm. Assoc. 1914.
Proc. Kansas Pharm. Assoc. 1914.
Proc. Kentucky Pharm. Assoc. 1914.
Proc. Louisiana Pharm. Assoc. 1914.
Proc. Maine Pharm. Assoc. 1914.
Proc. Maryland Pharm. Assoc. 1914.
Proc. Massachusetts Pharm. Assoc. 1914.
Proc. Michigan Pharm. Assoc. 1914.
Proc. Minnesota Pharm. Assoc. 1914.
Proc. Mississippi Pharm. Assoc. 1914.
Proc. Missouri Pharm. Assoc. 1914.
Proc. Nebraska Pharm. Assoc. 1914.
Proc. New Jersey Pharm. Assoc. 1914.
Proc. New York Pharm. Assoc. 1914.
Proc. North Carolina Pharm. Assoc. 1914.
Proc. North Dakota Pharm. Assoc. 1914.
Proc. Ohio Pharm. Assoc. 1914.
Proc. Pennsylvania Pharm. Assoc. 1914.
Proc. South Carolina Pharm. Assoc. 1914.
Proc. South Dakota Pharm. Assoc. 1914.

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Proceedings of State pharmaceutical associations—Continued.
Proc. Tennessee Pharm. Assoc., 1914.
Proc. Texas Pharm. Assoc. 1914.
Proc. Vermont Pharm. Assoc. 1914.
Proc. Virginia Pharm. Assoc. 1914.
Proc. West Virginia Pharm. Assoc. 1913 [1914].
Proc. Wisconsin Pharm. Assoc. 1914.
Proc. Soc. Exp. Biol.—Proceedings of the Society for Experimental Biology and Medicine, 1914, v. 11, 12, Nos. 1, 2.
Public Health Rep.—Public Health Reports, Washington, 1914, v. 29.
Pure Products, New York, 1914, v. 10.
Rend. Soc. chim. ital.—Rendiconte della societa chimica italianna, 1914, v. 6.
Rep. California Bd. Health.—Twenty-second Biennial Report of the State Board of Health of California for the fiscal years July 1, 1910, to June 30, 1912, Sacramento, 1913.
Rep. Chem. Lab. Am. M. Assoc.—Reports of the Chemical Laboratory of the American Medical Association, Chicago, 1914, v. 7.
Rep. Colorado Bd. Pharm.—Annual Report of the State Board of Pharmacy of Colorado, 1914.
Rep. Connecticut Agric. Exper. Sta.—Report of the Connecticut Agricultural Experiment Station, 1914.
Rep. Connecticut D. & F. Com.—Report of the Connecticut Dairy and Food Commissioner, 1914.
Rep. Council Pharm. & Chem.—Reports of the Council on Pharmacy and Chemistry, American Medical Association, 1914.
Répert. pharm.—Répertoire de Pharmacie, Paris, 1914, v. 26.
Rep. District of Columbia Health Off.—Report of the Health Officer of the District of Columbia, 1913, Washington, 1914.
Rep. Florida Bd. Health.—Twenty-sixth Annual Report of the State Board of Health of Florida, 1914.
Rep. Florida Dept. Agric.—Thirteenth Biennial Report of the Department of Agriculture of the State of Florida, 1914.
Rep. Ill. Bd. Pharm.—Annual Report of the State Board of Pharmacy of Illinois for the year 1913, Springfield, 1914.
Rep. Indiana Bd. Health.—Report of the Indiana State Board of Health, 1912, Indianapolis, 1914.
Rep. Kansas Bd. Health.—Seventh Biennial Report of the Kansas State Board of Health, 1914.
Rep. Louisiana Bd. Health.—Biennial Report of the Louisiana State Board of Health, 1912–13, New Orleans, 1914.
Rep. Maine Bd. Health.—Seventeenth Report of the State Board of Health of Maine, 1913, Waterville, 1914.
Rep. Massachusetts Bd. Health.—Report of the State Board of Health of Massachusetts, 1913, Boston, 1914.
Rep. Michigan D. & F. Com.—Report of the Dairy and Food Commissioner, Michigan, 1914.
Rep. Minnesota D. & F. Com.—Fifteenth Biennial Report of the Minnesota State Dairy and Food Commissioner, 1914.
Rep. Missouri F. & D. Com.—Annual Report of the Food and Drug Commissioner to the Governor of the State of Missouri, 1913, Jefferson City, 1914.
Rep. New York Dept. Health.—Thirty-fourth Annual Report of the State Department of Health, State of New York, Albany, 1914.
Rep. North Carolina Bd. Health.—Biennial Report of the North Carolina State Board of Health, 1913–14, Raleigh, 1914.

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Rep. North Dakota Agric. Exper. Sta.—Twenty-third Annual Report of the North Dakota Government Agricultural Experiment Station, Part 2, Food, Drugs, and Sanitation, 1912 [1914].

Rep. North Dakota F. Com.—Eleventh Annual Report of the Food Commissioner of the North Dakota Agricultural Experiment Station, 1914.

Rep. Ohio D. & F. Div.—Twenty-ninth Annual Report of the Dairy and Food Division, Agricultural Commission of Ohio for the fiscal year ending November 15, 1914, Columbus, 1915.

Rep. Pennsylvania Bd. Pharm. 1914.—The Annual Report of the State Pharmaceutical Examining Board of Pennsylvania, Twenty-sixth Annual, Harrisburg, 1915.

Rep. Philippine Islands Bur. Health.—Report of the Bureau of Health for the Philippine Islands, 1913, Manila, 1914.

Rep. Rhode Island Bd. Pharm.—Forty-fourth Annual Report of the State Board of Pharmacy, State of Rhode Island and Providence Plantations, Providence, 1914.

Rep. Rhode Island F. & D. Com.—Sixth Annual Report of the Board of Food and Drug Commissioners, Rhode Island, 1914.

Rep. South Carolina Com. Agric. Com. & Ind.—Tenth Annual Report of the Commissioner of Agriculture, Commerce, and Industries of the State of South Carolina, Columbia, 1914.

Rep. South Dakota F. & D. Com.—Thirteenth Annual Report of the Food and Drug Commissioner, South Dakota, 1913, Madison, 1914.

Rep. Virginia D. & F. Com.—Quarterly Report of the Dairy and Food Commissioner of Virginia, 1913, Richmond, 1914.

Rep. Wisconsin Bd. Pharm.—Thirty-third Annual Report of the Board of Pharmacy of the State of Wisconsin, 1914.

Retail Druggist, Detroit, 1914, v. 21.

Rev. chim. industrielle.—La Revue de chimie industrielle, Paris, 1914, v. 25, Nos. 1–7.

Rev. Farm.—Revista Farmaceutica, Buenos Aires, 1914, v. 57.

Rev. gén. chim.—Revue générale de chimie pure et appliqué, 1914, v. 17, Nos. 1–14.

Rev. internat. pharm. Brux.—Revue internationale de Pharmacie, Bruxelles (Bull. Soc. Roy. Pharm. Brux.), 1914, v. 2, Nos. 1–22.

Riedel's Berichte, Berlin, 1914.

Riedel's Mentor, Berlin, 1914.

Rocky Mountain Druggist (The), Denver, 1914, v. 28.

Schweiz. Apoth.-Ztg.—Schweizerische Apotheker-Zeitung, Zürich, 1914, v. 52.

Sci. Am.—Scientific American, 1914, v. 110, 111.

Sci. Am. Suppl.—Scientific American Supplement, 1914, v. 77, 78.

Science, New York, 1914, v. 39, 40.

Sc. & Ind. Bull.—Scientific and Industrial Bulletin of Roure-Bertrand Fils of Grasse, 1914, April.

Seifensieder Ztg.—Seifensieder Zeitung und Revu über die Harz, Fett und Oelindustrie, 1914, v. 41.

Semi-Ann. Rep.—Semi-Annual Report, Schimmel & Co., Miltitz, 1914, April.

Simmon's Spice, Mill, New York, 1914, v. 37.

Southern Pharm. J.—Southern (The) Pharmaceutical Journal, Dallas, 1914, v. 6.

Spatula (The), Boston, 1914, v. 20.

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S. R. A.-Chem.—Service and Regulatory Announcements, United States Department of Agriculture, Bureau of Chemistry, 1914.
Südd. Apoth.-Ztg.-Süddeutsch Apotheker Zeitung, Stuttgart, 1914, v. 54.
Svensk farm. Tidskr.—Svensk farmaceutisk Tidskrift, Stockholm, 1914, v. 18.
Svensk kem. Tidskr.—Svensk kemis Tidskrift, Kemistramfundet, Stockholm, 1914, v. 26.
Therap. Gaz.—Therapeutic Gazette, Detroit, 1914, v. 38.
Therap. Gegenw.—Therapie der Gegenwart, Berlin, 1914, v. 55.
Therapist (The), London, 1914, v. 24, Nos. 1–8.
Therap. Monatsh.—Therapeutische Monatshefte, Berlin, 1914, v. 28.
Tr. Am. Electrochem. Soc.—Transactions of the American Electrochemical Society, 1914, v. 25, 26.
Tr. Am. Inst. Chem. Eng.—Transactions of the American Institute of Chemical Engineers, 1913, New York, 1914, v. 6.
Tr. Faraday Soc.—Transactions of the Faraday Society, 1914, v. 9, 10, No. 1.
Tropenpflanzer (Der), Berlin, 1914, v. 18, Nos. 1–7.
Vet. J.—Veterinary Journal, London, 1914, v. 70.
Western Druggist (The), Chicago, 1914, v. 36.
Year-Book of Pharmacy (and Transactions of the British Pharmaceutical Conference), London, 1914.
Zentralbl. Biochem. u. Biophys.—Zentralblatt für Biochemie und Biophysik, Leipzig, 1914, v. 16, 17.
Zentralbl. exper. Med.—Zentralblatt der experimentellen Medizin, Berlin and Vienna, 1914, v. 5.
Zentralbl. Physiol.—Zentralblatt für Physiologie, Leipzig and Vienna, 1914, v. 28, 29, Nos. 1–6.
Ztschr. Allgem. österr. apoth.-ver.—Zeitschrift des Allgemeinen österreichischen Apotheker-Vereines, Vienna, 1914, v. 52.
Ztschr. anal. Chem.—Zeitschrift für analytische Chemie, Wiesbaden, 1914, v. 53.
Ztschr. anal. Chem.—Zeitschrift für angewandte Chemie, Berlin, 1914, v. 27.
Ztschr. anorg. Chem.—Zeitschrift für anorganische Chemie, Hamburg, 1914, v. 84–89, 90, Nos. 1–3.
Ztschr. Chemotherap.—Zeitschrift für Chemotherapie und verwandte Gebiete, 1914, v. 2.
Ztschr. Elektrochem.—Zeitschrift für Elektrochemie und Angewandte Physikalische Chemie, Halle, a. S. 1914, v. 20.
Ztschr. exper. Path. u. Therap.-Zeitschrift für experimentelle Pathologie und Therapie, Berlin, 1914, v. 15, 16.
Ztschr. Hyg.—Zeitschrift für Hygiene und Infektionskrankheiten, Leipzig, 1914, v. 78.
Ztschr. Immun. u. exper. Therap.—Zeitschrift für Immunitätsforschung und experimentelle Therapie, 1914, v. 21, 22, 23, Nos. 1–3.
Ztschr. öffentl. Chem.—Zeitschrift für öffentliche Chemie, Plauen, i. V. 1914, v. 20.
Ztschr. physik. Chem.—Zeitshcrift für physikalische Chemie, Leipzig, 1914, v. 86–88, 89, Nos. 1, 2.
Ztschr. physiol. Chem.—Zeitschrift für physiologische Chemie, Hoppe-Seyler, Strassburg, 1914, v. 88–92, 93, Nos. 1–4.
Ztschr. Unters. Nahr. u. Genussm.—Zeitschrift für Untersuchung der Nahrungs und Genussmittel, Berlin, 1914, v. 27, 28.
Ztschr. Wiss. Mikros.—Zeitschrift für Wissenchaftliche Mikroskopie, 1914, v. 31, Nos. 1, 2.

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2. TITLE ABBREVIATIONS—PHARMACOPŒIAS AND NON-OFFICIAL STANDARDS.

Ph. Arg. I.—Farmacopea Nacional Argentina, Primera edición, 1898.
Ph. Austr. VIII.—Pharmacopœa Austriaca, editio octava, 1906.
Ph. Belg. III.—Pharmacopœa Belgica, editio tertia, 1906.
Ph. Brit. V.—British Pharmacopœia, 1914.
Ph. Chil. I.—Farmacopea Chilena, 1886.
Ph. Dan. VII.—Pharmacopœia Danica, 1907.
Ph. Fenn. V.—Pharmacopœa Fennica, edito quinta, 1914.
Ph. Fr. V.—Codex Medicamentarius Gallicus, Pharmacopée Française, 1908.
Ph. Germ. V.—Deutsches Arzneibuch, 5. Ausgabe, 1910.
Ph. Helv. IV.—Pharmacopœa Helvetica, editio quarta, 1907.
Ph. Hisp. VII.—Farmacopea Oficial Espanola, séptima edicion, 1905.
Ph. Hung. III.—Pharmacopœa Hungarica, editio tertia, 1909.
Ph. Ital. III.—Farmacopea ufficale del regno d'Italia, Terza edizione, 1909.
Ph. Japon. III.—The Pharmacopœia of Japan, 1906 (English translation, 1907).
Ph. Mex. IV.—Nueva Farmacopea Mexicana, cuarta edición, 1904.
Ph. Ndl. IV.—Pharmacopœa Nederlandica, editio quarta, 1905.
Ph. Norv. IV.—Pharmacopœa Novegica, editio quarta, 1913.
Ph. Ross. VI.—Pharmacopœa Rossica, sixth edition, 1910.
Ph. Serv. II.—Pharmacopœia Serbica, editio secunda, 1908.
Ph. Ven. I.—Farmacopea Venezolana, 1898.
U. S. P. VIII.—Pharmacopœia of the United States, 8th Dec. Rev., 1905.
N. F. III.—The National Formulary of Unofficial Preparations, Baltimore, 1906.
N. N. R.—New and Nonofficial Remedies, Chicago, 1914.
B. P. C.—British Pharmaceutical Codex, London, 1911.

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DIGEST OF COMMENTS ON THE PHARMACOPŒIA OF THE UNITED STATES OF AMERICA AND ON THE NATIONAL FORMULARY.[1]

I. GENERAL COMMENTS.

1. LEGAL STATUS AND DEVELOPMENT.

1. PURE FOOD AND DRUGS LAW.

Fuller, H. C.: The food and drugs act has proven to be one of the most interesting and valuable pieces of legislation that has been enacted in this country for a long time. As a whole it has worked quite well, and certain features which have allowed technical violations have been corrected or an attempt is being made to correct them.—J. Am. Pharm. Assoc. 1914, v. 3, p. 133.

Wallis, James H.: The two minor reasons why the food and drug control work has not been more effective are lack of effective cooperation between food and drug control officials and insufficient educational work.—Pacific Pharm. 1914, v. 7, p. 283; also Drug. Circ. 1914, v. 58, p. 97.

Rogers, C. H.: The importance of food and drug chemistry in the United States. A review of efforts to enforce food and drug laws.—Proc. Minnesota Pharm. Assoc. 1914, p. 139–142.

Beal, James H.: The legislative problems of pharmacy. A review of the poison and antinarcotic laws and the general food and drug laws, with a plea for the need of solidarity for pharmacists.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1051–1061; also Proc. North Carolina Pharm. Assoc. 1914, p. 36–49.

Bevan, Archibald: Extreme care is needed in the drafting of legislation. A good part of the troubles of the druggists can be traced to loosely drawn statutes in which the original intention of the maker can neither be fathomed nor explained.—Pacific Drug Rev. 1914, v. 26, July, p. 23.

Woodruff, Charles M.: For manifest reasons additional drug legislation is not desirable and should be discouraged.—Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 321.

Wilson, R. C.: Our pharmacy laws are antiquated, inefficient, and ambiguous. They should be supplanted by laws under which we may be protected and under which we may conscientiously and intelli-

[1] Manuscript submitted for publication Aug. 18, 1915.

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gently practice, and which may be capable of enforcement.—Proc. Georgia Pharm. Assoc. 1914, p. 19.

Dunn, Charles W.: The administration of State food and drug laws.—Oil, Paint & Drug Rep. 1914, v. 86, November 30, p. 50.

Editorial: The present-day methods of enforcing food and drug laws are hopelessly inadequate.—Nat. Drug Clerk, 1914, v. 2, p. 454–455.

Anon.: An announcement that the United States Chamber of Commerce is to study food and drug questions.—Am. J. Pharm. 1914, v. 86, p. 529–530; also J. Am. Pharm. Assoc. 1914, v. 3, p. 1609.

Anon.: Proceedings of the National Drug Trades Conference, Washington, D. C., January 13, 1914.—J. Am. Pharm. Assoc. 1914, v. 3, p. 261–271. See also p 744–747, and Oil, Paint & Drug Rep. 1914, v. 85, January 19, p. 32G.

News Note: Reprint of the resolutions adopted by the National Drug Trades Conference respecting proposed drug legislation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 590–592.

News Note: A report of the proceedings of the National Food Trade Conference, held at the Waldorf Astoria Hotel, New York City, February 27.—J. Am. Pharm. Assoc. 1914, v. 3, p. 584–587; also Am. Food J. 1914, v. 9, p 81–100.

Wallis, James H.: The food and drugs control work in the United States is not 50 per cent efficient. This is startling but true. The trouble lies in defective organization and utter lack of correlation of several branches of what really is but one subject.—Am. Food J. 1914, v. 9, p. 11; also Pacific Pharm. 1914, v. 7, p. 283.

West, Charles A.: The subject of uniform legislation does not grow threadbare by the handling, but rather takes on, like the chameleon, new hues and new values the more it is considered.—Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 24; also Proc. N. W. D. A. 1914, p. 115.

Wallace, John C.: Report of the delegates to the National Drug Trades Conference.—J. Am. Pharm. Assoc. 1914, v. 3, p. 191–196. See also N. A. R. D. Notes, 1914, v. 18, p. 1109.

Ryan, Frank G.: Manufacturing pharmacists should go on record as opposed to any change in the food and drug law which will repeal the so-called variation clause.—Proc. N. A. M. M. P. 1914, p. 20; also Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 32E, and West, Charles A.: v. 86, September 30, p. 25.

Woodruff, Charles M.: The members of the drug trade who are clamoring for the elimination of the drug-variation clause have no arguments to support their contentions and are accusing manufacturers of wanting to market substandard goods for fraudulent purposes.—Proc. N. A. M. M. P. 1914, p. 148.

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Anon.: Reprint of the suggestions made by the Bureau of Chemistry regarding the proper labeling of medicinal preparations under the Sherley amendment.—Am. J. Pharm. 1914, v. 86, p. 523–525; also Pharm. Era, 1914, v. 47, p. 527, and Oil, Paint & Drug. Rep. 1914, v. 85, September 7, p. 41.

Wilbert, M. I.: The patent-medicine problem. A review of past activities of the American Pharmaceutical Association.—Am. J. Pharm. 1914, v. 86, p. 256–267.

Stanaland, H. G.: A plea for uniform labeling and a warning against the present haphazard methods employed by manufacturing pharmacists in labeling their products.—Drug. Circ. 1914, v. 58, p. 349. See also Abbott, William A.: Proc. Minnesota Pharm. Assoc. 1914, p. 27.

Lattimer, George W.: The abolishment of the guarantee legend on foods, drugs, and insecticides is to take effect in May, 1916.—Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 7.

Patch, E. L.: The continued activities under pure food and drug legislation are undoubtedly working toward better standards and greater carefulness, but there is still a tendency to allow the enforcement of regulations to become one-sided and work serious and uncalled-for injustice.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1283.

2. SALE AND USE OF POISONS.

Murray, B. L.: The need of a proper national poison law upon which officials, such as the postal officials, the producer, the dealer, and the consumer alike could rely, should be emphasized.—Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34; also Proc. N. W. D. A. 1914, p. 254.

Hemm, Francis: Observations on desirable restrictions on the sale of poisons. A uniform national law or a unification of State poison laws is at present badly wanted.—Meyer Bros. Drug. 1914, v. 35, p. 304.

Wilbert, M. I.: The need for greater uniformity in laws relating to the manufacture and sale and use of poisons and habit-forming drugs.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1168–1171.

Beal, James H.: In some States, in addition to that which is specifically known as the poison law, there may be two or three or a half a dozen other acts relating to the sale of poisonous drugs.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1054; also Proc. North Carolina Pharm. Assoc. 1914, p. 40.

Haussamen, H. L.: A definite specific ruling as to just what medicinal compounds, drugs, and medicines can be transmitted through the mail upon the prescriptions of licensed physicians will be greatly appreciated.—Proc. North Dakota Pharm. Assoc. 1914, p. 83.

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Resolution adopted by the American Association of Pharmaceutical Chemists on the postal regulations forbidding the sending of poisons by the mails.—Pract. Drug. 1914, v. 32, p. 314. See also Proc. N. A. M. M. P. 1914, p. 77–78.

Lauber, Joseph E.: Safeguarding the use of poisons.—J. Am. Pharm. Assoc. 1914, v. 3, p. 257–259.

Cheatham, T. A.: Inspection of 640 retail drug stores in Georgia showed that 122 were without poison registers. In addition to this, 53 general dealers were found who were violating the poison law by selling various poisons of a dangerous nature.—Proc. Georgia Pharm. Assoc. 1914, p. 46.

Anon.: The need for educating the public regarding poisons.—J. Am. Pharm. Assoc. 1914, v. 3, p. 275–276.

Bowerman, K. B.: The question of a poison container is important and should be given serious consideration.—Pacific Drug Rev. 1914, v. 26, July, p. 17. See also Rees, D. R.: Proc. California Pharm. Assoc. 1914, p. 9–11, and Lackner, Rolph J.: New York M. J. 1914, v. 100, p. 1025.

Murray and Frame: Some aspects of our poison laws and of methods for defining a poison.—J. Am. Pharm. Assoc. 1914, v. 3, p. 663–667.

West, Charles A.: The question as to what is a poison and the question of uniform poison legislation will always be an issue until a Federal poison law is enacted.—Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 25; also Proc. N. W. D. A. 1914, p. 127.

Remington, J. P.: A poison, in the common acceptation of the word, is a substance that produces a deleterious action upon life; but this definition is too broad and general to be serviceable in food and drug legislation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 430. See also Northwestern Druggist, 1914, v. 15, April, p. 60.

Rees, R. D.: A poison has been found to be the most difficult thing to define. As generally understood, it is something that must be taken internally and of which you can not take a teaspoonful without fatal results.—Proc. California Pharm. Assoc. 1914, p. 8.

Emerson, J. C.: A poison may be defined as a substance which is fatal to animal life in quantity of 30 grains or less.—N. A. R. D. Notes, 1914, v. 1301.

Beal, J. H.: Definitions, as are found in the Pennsylvania poison law, which make the question of whether a drug should be labeled poison depend upon the quantity required to produce death must be discredited as impracticable.—J. Am. Pharm. Assoc. 1914, v. 3, p. 668.

Hemm, Francis: The poison schedule as now included in the law has outlived its usefulness and is in need of revision.—Proc. Missouri Pharm. Assoc. 1914, p. 49.

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Wilbert, M. I.: The sale and use of poisons, with table showing the number of deaths by poisoning reported for 1911 and 1912 by the registrar-general of births, deaths, and marriages in England and Wales, and table showing the number of cases of accidental poisoning and of suicide by poisoning reported by the coroner of St. Louis for the years 1911 to 1914, inclusive.—Public Health Rep. 1914, v. 29, p. 3027–3030.

Fleury, Ferdinand: A review of some classical reports of cases of poisoning.—Pharm. Praxis, 1914, v. 12, p. 472–478.

3. SALE AND USE OF NARCOTIC DRUGS.

Whilden, Chas. B.: A review of the possibilities and objects of the Harrison bill to limit the manufacture and sale of certain narcotics to licensed persons.—Proc. California Pharm. Assoc. 1914, p. 45–48.

West, Charles A.: The Harrison bill in its amended form is in as satisfactory shape as we could expect it to be.—Proc. Am. Assoc. Pharm. Chem., 1914, p. 23.

Freericks, Frank H.: Comments on the Harrison bill.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1–4. See also Beal, J. H., p. 4–8, and 479–481.

Editorial: Announcement that the Harrison bill was signed by the President on Thursday, December 17, 1914.—N. A. R. D. Notes, 1914, v. 19, p. 551.

Beal, J. H.: The laws relating to the sale of habit-forming narcotic drugs are often a patchwork of overlapping statutes and incomplete.—Proc. North Carolina Pharm. Assoc. 1914, p. 40; also J. Am. Pharm. Assoc. 1914, v. 3, p. 1054.

Pritchard, B. E.: There is not a problem or an issue before the people of the United States to-day that is more vital than that of the curtailing of the use of narcotics and the controlling of their distribution to the laity.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 278.

Wiley, H. W.: All habit-forming drugs should be strictly interdicted to lay trade. This interdiction should not be coupled with the usual proviso which permits these habit-forming drugs to be sold in small quantities. A law with such a proviso is a farce.—Meyer Bros. Drug. 1914, v. 35, p. 336.

Burnet, James: It is more than time that new regulations were introduced in this country to check the indiscriminate distribution of drugs to the public.—Lancet, 1914, v. 187, p. 523.

Frary, Guy E.: The dispensing of habit-forming drugs by physicians should be prohibited, and these substances and preparations should only be dispensed by registered pharmacists under a physi-

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cian's written prescription.—Proc. South Dakota Pharm. Assoc. 1914, p. 86.

Cheney, Frank J.: The dispensing doctor is responsible for at least 95 per cent of the habitual users of opium and its compounds and alkaloidal salts.—Oil, Paint & Drug Rep. 1914, v. 85, May 18, p. 33.

Schnaidt, H. J.: Considerable complaint has been made during the past year that in a number of places druggists are supplying habit-forming drugs to persons who should not be allowed to obtain them.—Proc. South Dakota Pharm. Assoc. 1914, p. 13.

Johnston, A. C.: Report on narcotic investigations in Ohio. Illustrated.—Rep. Ohio D. & F. Div. 1914, p. 49–53.

Wilbert, M. I.: Sale and use of cocaine and narcotics, with table showing the quantities of the several drugs entered for consumption in the United States during the years 1910–1913.—Public Health Rep. 1914, v. 29, p. 3180–3183.

Bleuler, E.: The habituation to drugs. An attempt to correct the same.—Münch. med. Wchnschr. 1914, v. 61, p. 605–606.

Lichtenstein, Perry M.: Narcotic addiction. Based on observations and treatment of 1,000 cases.—New York M. J. 1914, v. 100, p. 962–966.

Brown, Lucius P.: Up to April 1, 1914, the Pure Food and Drug Department of Tennessee has issued 1,403 permits to refill prescriptions, of which very few were renewals of existing permits.—J. Am. M. Assoc. 1914, v. 62, p. 1427.

Kennedy, Foster: The effects of narcotic drug addiction. Morphinism is a disease, in the majority of cases initiated, sustained, and left uncured by members of the medical profession.—New York M. J. 1914, v. 100, p. 20–22.

Terry, C. E.: Nature and origin of drug addiction.—Am. J. Public Health, 1914, v. 4, p. 30–32.

Bishop, Ernest S.: Up to the present time altogether too little attention has been paid to narcotic addiction as a disease.—J. Am. M. Assoc. 1913, v. 60, p. 431.

Douglas, C. J.: The institutional treatment of drug addiction. There is no chronic disease known to medicine that is more surely curable than morphinism.—New York M. J. 1914, v. 99, p. 127–128.

König, H.: The prognosis in morphine addiction.—Berl. klin. Wchnschr. 1914, v. 51, p. 1061–1064. See also J. Am. M. Assoc. 1914, v. 63, p. 204.

4. SALE AND USE OF HOUSEHOLD REMEDIES.

Zinn, C. E.: The term "household remedies" has not been defined, and it is pretty hard to draw the line as to what they are.—Proc. Missouri Pharm. Assoc. 1914, p. 54.

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Dunn, Charles Wesley: A "domestic remedy" is a remedy usually manufactured by a person not connected with the medical or pharmaceutical professions and always sold to the public through the several retail channels.—N. A. R. D. Notes, 1914, v. 18, p. 769.

Drew, Chas. W.: One of the most deplorable habits of the American people is that of habitually taking medicine upon their own initiative.—Proc. South Dakota Pharm. Assoc. 1914, p. 33.

Kemp, Ervin F.: Self-medication, so called, is sure to increase. With growth of intelligence and knowledge along hygienic and preventive lines will come greater reliance in self-diagnosis.—Western Druggist, 1914, v. 36, p. 363.

Engelhard, George P.: Proprietary medicines in their relations to the people, to pharmacy, and the medical profession.—Western Druggist, 1914, v. 36, p. 210–213.

Editorial: The freedom allowed to quackery in this country is unreasonable. To estimate properly the effect of drugs on the progress of disease in the human body is one of the most difficult of tasks even for highly trained observers.—Nature, 1914, v. 94, p. 365–366.

Anon.: The Nation's medicine bill. Reprint of portion of an article from Public Health Reports.—Spatula, 1914, v. 21, p. 89.

Dowling, Oscar T.: The practice of having general stores handle medicine is fraught with grave danger to the public.—Proc. Louisiana Pharm. Assoc. 1914, p. 25.

Beal, J. H.: A form of law proposed for the regulation of the itinerant vending of drugs, medicines, and poisons.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1690–1694.

Ladd, E. F.: There is needed a law that will prohibit the sale of any patent medicine or proprietary product that has not been registered under the provisions of a State law requiring that the formula shall be accurately stated, qualitatively and quantitatively, in the language, descriptions, and abbreviations used in the U. S. P. or other accepted pharmacopœias or formularies.—Proc. South Dakota Pharm. Assoc. 1914, p. 110.

Barnard, H. E.: The waste of money in the purchase of patents, proprietaries, and toilet preparations is astonishingly great, and in spite of the activities of the Federal Government and State departments, the people are as credulous as before any attempt was made to enlighten them.—Rep. Indiana Bd. Health, 1914, p. 440.

Street, John Phillips: A report of the analyses of 130 proprietary medicines.—Rep. Connecticut Agric. Expr. Sta. 1914, p. 256–332.

Frary, Guy E.: The legal definition of a drug should be changed to include medicines for internal or external use, and also antiseptics and cosmetics.—Proc. South Dakota Pharm. Assoc. 1914, p. 85.

Roemer, John: A general discussion of the patent medicine problem.—Proc. New York Pharm. Assoc. 1914, p. 286.

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Wilbert, M. I.: The patent medicine problem.—J. Am. Pharm. Assoc. 1914, v. 3, p. 572–577.

Utech, P. Henry: Our attitude toward "fake" proprietaries.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 355–356.

Anon.: Government suggestons to manufacturers of proprietary labels in regard to what not to claim and how to comply with the Sherley amendment.—Am. Druggist, 1914, v. 62, p. 395. See also Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 32 I.

Editorial: Comment on the labeling suggestions published by the Department of Agriculture.—Bull. Pharm. 1914, v. 28, p. 487.

Schiedat, M.: The present conditions in the traffic in secret remedies, with special consideration of their future regulation.—Vrtljschr. ger. Med. 1914, v. 48, p. 349–381.

Anon.: A summary of the report of the select committee on patent medicines, appointed by the treasury in May, 1912.—Brit. M. J. 1914, v. 2, p. 404–405. See also Pharm. J. 1914, v. 93, p. 318–319; also p. 315, and Science, 1914, v. 40, p. 374–375.

Editorial: A blue book containing the report of the select committee on proprietary medicines, together with the minutes of evidence, has been published.—Pharm. J. 1914, v. 93, p. 549. See also Am. J. Pharm. 1914, v. 86, p. 561.

Sewill, Henry: Secret remedies and pharmacy law amendment.—Brit. M. J. 1914, v. 2, p. 522.

Anon.: A list of names of widely used nostrums, compiled by the Ohio Agriculture Commission, is reprinted.—N. A. R. D. Notes, 1914, v. 18, p. 472–473.

Anon.: The latest list published by the Internal Revenue Bureau of medicinal preparations that are too alcoholic.—N. A. R. D. Notes, 1914, p. 336–339.

5. DRUG INSPECTION WORK.

Bernstein, Ernest: A drug store should be a place where nothing is obtainable but drugs and where all the activities and energies, all the thoughts, of the owners and employees are devoted to this.—Proc. Louisiana Pharm. Assoc. 1914, p. 31.

Taylor, George B.: A report on carelessness in the filling of simple prescriptions in the State of Louisiana.—Rep. Louisiana Bd. Health, 1912, 1913, p. 176–187.

Patch, E. L.: Reports of various boards show that there is still remarkable variation in the strength of simple products as supplied by the retailer.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1284.

Hemm, Francis: Fifty per cent of the druggists in Missouri are running their stores illegally and pharmacists should insist that the board of pharmacy correct this condition just as quickly as possible.—Proc. Missouri Pharm. Assoc. 1914, p. 65.

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Wilson, R. C.: The drug inspector and the commissioner are powerless to carry on their work unless supported by druggists themselves. The officials stand ready and willing to make drug inspection just as real and efficient as is indicated by the support given by the retail druggist.—Proc. Georgia Pharm. Assoc. 1914, p. 16.

Caspari, Charles M.: Thousands of samples have been examined and hundreds of them have been found to vary from the pharmacopœial standard.—Proc. Maryland Pharm. Assoc. 1914, p. 73.

Barnard, H. E.: During the year 399 drug samples have been examined. Of this number 257 were passed as legal and 142, or 35.5 per cent, as illegal.—Rep. Indiana Bd. Health, 1914, p. 439.

Lythgoe, Hermann C.: Of 229 samples of drugs examined, 50 were found to be adulterated or varying from the legal standard.—Bull. Massachusetts Bd. Health, 1914, v. 9, p. 243.

Newcomb, George D.: Of a total number of 116 samples analyzed by the State laboratory, 35 were found to be below standard. Twenty-two of these samples below standard were found to contain methyl alcohol.—Proc. Iowa Pharm. Assoc. 1914, p. 28.

Lythgoe, Hermann C.: Of 1,393 samples of drugs examined, 204 were found to be adulterated, and 1,189 were found to be genuine.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 411.

Congdon, Leon A.: During the fiscal year ending July 1, 1913, 211 drug samples were examined, of which 149 were found to be up to standard. During the year ending July 1, 1914, 393 drug samples were examined, 84 of which were found to be of standard quality, and 207 were found to be above or below standard, 61 above and 146 below.—Rep. Kansas Bd. Health, 1914, p. 100.

Todd, A. R.: The results of the Michigan Dairy and Food Commission show that for the year ending July 1, 1911, a total of 631 samples were analyzed, of which number 357, or 56.5 per cent, were adulterated. In 1912, 282 were analyzed, 160, or 56.7 per cent, of which were adulterated. In 1913, 504 were analyzed, 252, or 50 per cent, being adulterated. In 1914, 571 were analyzed and 214, or 37.5 per cent, were adulterated.—Rep. Michigan D. & F. Com. 1914, p. 175.

Porter, C. A.: Two hundred and seventy-nine samples of 12 different articles were examined, and of this number 173 were found to be adulterated, or 62 per cent were either above or below standard. It is just as much against the law for an article to be 125 per cent as 75 per cent.—Proc. Kentucky Pharm. Assoc. 1914, p. 110.

Stallings, R. E.: The analyses of drugs show that some druggists are quite careless in making their preparations.—Proc. Georgia Pharm. Assoc. 1914, p. 52.

Wilbert, M. I.: A summary of the results of analyses of 26 official articles reported on in Hygienic Laboratory Bulletin No. 93.—

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Public Health Rep. 1914, v. 29, p. 1137–1144; also Am. J. Pharm. 1914, v. 86, p. 550–558.

Murray, B. L.: Probably one of the greatest laxities in handling drugs and chemicals lies in the use of poor containers.—Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Allen, R. M.: An investigation is to be made among pharmacists into the methods of storing perishable drugs, and the weights and measures used in filling prescriptions.—Rep. Kentucky Agric. Exper. Sta. 1911–1913, Lexington, 1914, p. 3.

Lythgoe, Hermann C.: It has been shown that the largest amount of fraudulent adulteration and substitution is practiced by the small dealers.—Bull. Massachusetts Bd. Health, 1914, v. 9, p. 269.

Metz, Herman A.: Substitution and drug counterfeiting may entail the sacrifice of human life and the permanent impairment of health.—Montreal Pharm. J. 1914, v. 25, p. 94–96.

Sudro, W. F.: It is generally recognized that once a seal is broken, a package opened, or a cork drawn the manufacturer can no longer be held responsible for the contents of the package; the pharmacist assumes all responsibility for the nature and purity of the article.—Rep. North Dakota F. Com. 1914, p. 30. See also Brown, L. A.: Proc. Kentucky Pharm. Assoc. 1914, p. 123.

6. THE PHARMACOPŒIA AS A LEGAL STANDARD.

Beal, J. H.: The relation of the U. S. P. to the law and to the general public.—Western Druggist, 1914, v. 36, p. 399–402, and Am. Druggist, 1914, v. 62, p. 447–449.

Remington, J. P.: The Pharmacopœia is essentially a book of standards. Many men of many minds have contributed to its pages.—Am. Druggist, 1914, v. 62, p. 202. See also Proc. West Virginia Pharm. Assoc. 1914, p. 87.

Woodruff, Charles M.: The United States Pharmacopœia for the purposes for which it was primarily intended is a commendable enterprise. Too much can not be said in its favor.—Proc. N. A. M. M. P. 1914, p. 150; also Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 321.

Noyes, C. R.: The Pharmacopœia is a thoroughly practical as well as scientific standard. The requirements in the Pharmacopœia are in almost every case especially suitable for medicinal purposes.—J. Am. Pharm. Assoc. 1914, v. 3, p. 605; also Proc. Minnesota Pharm. Assoc. 1914, p. 188.

Stewart, F. E.: The U. S. P. is the law of the land, not only for interstate commerce, but also for State commerce in most of the States.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1166.

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Nitardy, F. W.: While jobbers at first did not carry such things as U. S. P. alcohol, turpentine, and linseed oil, they are now obtainable by reason of shipping back a few things not of standard quality.—J. Am. Pharm. Assoc. 1914, v. 3, p. 699.

Diner, J.: The Pharmacopœia, it is admitted, is a good many years behind the times. It is thought a sacred book; though if age is any criterion, some of the formulas contained therein might be considered sacred.—J. Am. Pharm. Assoc. 1914, v. 3, p. 460.

Todd, A. R.: Suggestions for a better U. S. P. and N. F. and difficulties encountered in the enforcement of the drug law in regard thereto.—Rep. Michigan D. & F. Com. 1914, p. 190–191.

Vanderkleed, C. E.: The U. S. P. IX will find an entirely different state of affairs as regards the condition of the drug market and will be received into a much clarified atmosphere.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 125.

7. SUPPLEMENT TO THE PHARMACOPŒIA.

Remington, J. P.: It is not the intention in the future to wait for the usual period of 10 years to issue a supplement, and any addition or deletion which may become necessary will be published, so that the book may be kept more fully abreast with the times.—J. Am. Pharm. Assoc. 1914, v. 3, p. 866. See also Northwestern Druggist, 1914, v. 15, April, p. 60.

McClain, H. W.: In former revisions of the U. S. P. the book has been about 10 years behind the times. In the present revision new methods are being used and we are promised that the new U. S. P. will not only be up to date but will be kept up to date by the publication of supplements from time to time as circumstances require.—Proc. South Dakota Pharm. Assoc. 1914, p. 45; also Northwestern Druggist, 1914, v. 15, September, p. 25.

Editorial: There is an evident demand for local pharmacopœias and formularies. It is to be regretted that such a small modicum of care and skill has sometimes been utilized in their preparation.—Pharm. J. 1914, v. 93, p. 550.

Stebra-Böhm, Johann: The Elenchus to the Ph. Austr. VIII is not satisfactory. A number of medicaments are prescribed in the several formulas for which tests are not given in the body of the book.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 299.

8. UNITED STATES PHARMACOPŒIAL CONVENTION.

Beal, J. H.: The United States Pharmacopœial Convention represents the professions of medicine and pharmacy in the United States in the broadest possible way. It represents all recognized schools of medicine and their professional organizations; it repre-

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sents those who manufacture and deal in drugs and medicinal products, those who employ them in the treatment of disease, and those who interpret and apply the laws relating to these subjects.—Western Druggist, 1914, v. 36, p. 400, and Am. Druggist, 1914, v. 62, p. 447.

Remington, J. P.: The United States Pharmacopœial Convention is a distinctly American organization. No such pharmacopœial organization exists in Europe or any other part of the world. The medical and pharmaceutical professions are equally represented.—Proc. West Virginia Pharm. Assoc. 1914, p. 83–84. See also Northwestern Druggist, 1914, v. 15, April, p. 60.

9. GENERAL PRINCIPLES.

Remington, J. P.: In the revision of the United States Pharmacopœia hearings have been already held; in fact the present Pharmacopœia is being thoroughly revised in public.—J. Am. Pharm. Assoc. 1914, v. 3, p. 429; also Northwestern Druggist, 1914, v. 15, April, p. 60.

Anon.: Publicity as to the forthcoming changes was ordered by the convention of 1910. The proposed changes are now being published in the journal of the American Pharmaceutical Association. It is anticipated that the book itself will be on the market before the close of the present calendar year.—Meyer Bros. Drug. 1914, v. 35, p. 211; also Proc. Missouri Pharm. Assoc. 1914, p. 127.

10. PUBLICATION AND CONTROL.

Remington, J. P.: The work of revising the U. S. P. is fast approaching completion. It is expected that printing in galley will begin July 1.—J. Am. Pharm. Assoc. 1914, v. 3, p. 863; also Pharm. Era, 1914, v. 47, p. 460.

McClain, H. W.: The ninth revision of the Pharmacopœia is nearly finished. Printing in galley has already been in progress for several weeks. It is expected that mechanically as well as otherwise the new Pharmacopœia will be more nearly perfect than former editions have been.—Proc. South Dakota Pharm. Assoc. 1914, p. 46.

Whelpley, H. M.: It is anticipated that the Pharmacopœia will be on the market before the close of the present calendar year (1914).—Proc. Missouri Pharm. Assoc. 1914, p. 127.

Schnaidt, H. J.: The new Pharmacopœia of the United States will be out some time in January.—Proc. South Dakota Pharm. Assoc. 1914, p. 14.

Remington, J. P.: The correction of the proof for the Pharmacopœia should be completed by March 1. Three to four months must then elapse before the Pharmacopœia can be enforced. This

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will probably make the date July 1, 1915.—Pharm. Era, 1914, v. 47, p. 460; also Proc. Vermont Pharm. Assoc. 1914, p. 88.

Worrall, Harry: The eighth revision of the Pharmacopœia was published about July 1, 1905, and a copy was with difficulty obtained by July 26. It became official on September 1, 1905. It was generally considered a very arbitrary procedure because of the short time given in which to prepare for a number of very important changes.—N. A. R. D. Notes, 1914, v. 18, p. 314.

Cristianson, Lars: The Pharmacopœia of the United States should be printed on better paper and have a better binding.—N. A. R. D. Notes, 1914, v. 18, p. 203. See also Sloan, B., p. 156.

Anon.: It was decided by the committee on National Formulary to make the N. F. IV consistent with the U. S. P. IX and to publish both standard books at the same time and thereby avoid any duplication in formulas.—Pract. Drug. 1914, v. 32, p. 412.

Kressin, L. H.: The new U. S. P. and N. F. will be in our midst very soon and that will be the time to start your propaganda work with renewed interest.—Proc. Wisconsin Pharm. Assoc. 1914, p. 17.

11. THE PHYSICIAN AND THE PHARMACOPŒIA.

Chambers, H. L.: A Pharmacopœia for the physician and the dispensing druggist.—J. Am. Pharm. Assoc. 1914, v. 3, p. 51–54.

Blosmo, O. J.: Fewer patents and proprietaries are being used at the present time and doctors are more particular in respect to the quality and standard of drugs.—J. Am. Pharm. Assoc. 1914, v. 3, p. 603.

Roemer, John: If the U. S. P. and N. F. are to act as a link between the physician and the pharmacist then these books must include some information useful to the physician.—J. Am. Pharm. Assoc. 1914, v. 3, p. 460.

Chambers, H. L.: There are five points concerning each preparation that are of vital interest and importance to physicians: (1) Preservation, (2) incompatability, (3) physiological action (including toxicology), (4) therapy, (5) synergism.—J. Am. Pharm. Assoc. 1914, v. 3, p. 53.

Needham, R. H.: Physicians and prescription writing; a criticism.—J. Am. Pharm. Assoc. 1914, v. 3, p. 961–963.

Fantus, Bernard: To the question, Has the quality of prescription writing improved or deteriorated within the last ten years? Fifty-five per cent reported an improvement, and 20 per cent a deterioration.—J. Am. Pharm. Assoc. 1914, v. 3, p. 596.

Kreig, Arch.: The Pharmacopœia should be a necessary book, a ready reference book, and familiarity with it should be one of the

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compulsory requirements to the practice of medicine.—Proc. West Virginia Pharm. Assoc. 1914, p. 77.

Remington, J. P.: In the great medical schools of this country, the Pharmacopœia is almost an unused book. The medical professors do not teach the Pharmacopœia any more than they can possibly help. They do not instruct the young physicians to prescribe official products.—Proc. West Virginia Pharm. Assoc. 1914, p. 83.

12. VALUE OF CRITICISM.

Remington, J. P.: The eighth revision has had the advantage of a Digest of Comments Published by the Public Health Department of the Government, by which the principle of publicity was greatly extended. Of course it will be impossible to embody every bit of advice which is now in the hands of the chairman of revision.—J. Am. Pharm. Assoc. 1914, v. 3, p. 429–430; also Northwestern Druggist, 1914, v. 15, April, p. 60.

Whelpley, H. M.: Not only members of our committee on Pharmacopœia, but all who feel interested in the Pharmacopœia and National Formulary should study the Digest of Comments on the U. S. P. and N. F., published by the United States Public Health Service, Washington, D. C.—Proc. Missouri Pharm. Assoc. 1914, p. 128.

A book review of Hygienic Laboratory Bulletin No. 93 says in part: This work is of inestimable value to those who are in any way interested in the U. S. P. Only through a careful study of these documents is it possible to obtain an idea of the enormity of the task of revising a work like the U. S. P. which is to serve as a standard for the drugs used in the treatment of disease.—Pacific Pharm. 1914, v. 8, p. 42–43.

A book review of Hygienic Laboratory Bulletin No. 87 commends the publication to all who have occasion to look up literature relating to drugs and their preparations. The publication reviews no less than 245 periodicals.—Chem. Weekblad, 1914, v. 11, p. 302.

The American Pharmaceutical Association adopted the following recommendation from the scientific section: "It is recommended by the scientific section that the American Pharmaceutical Association express to the Surgeon General of the Public Health Service its appreciation of the publication of 'Digest of Comments on the U. S. Pharmacopœia and National Formulary,' and that it requests the continuance of this publication, if possible, more promptly."—J. Am. Pharm. Assoc. 1914, v. 3, p. 1504.

13. COMMITTEE OF REVISION.

Beal, J. H.: The Pharmacopœial Convention elects and instructs a general committee of revision of 50 members, and this general com-

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mittee of 50 appoints from its members an executive committee of 15, which has immediate charge of the researches and investigations, all of which, however, are subject to the approval of the general committee.—Western Druggist, 1914, v. 36, p. 400, and Am. Druggist, 1914, v. 62, p. 447.

Roemer, John: The revision committee of the U. S. P. rests on antiquated prejudices of 100 years ago in revising the U. S. P.—J. Am. Pharm. Assoc. 1914, v. 3, p. 460.

Remington, J. P.: The spirit which actuates both committees and the chairman is to get the best, without fear or favor. Publicity has been a prominent feature in this revision. For the first time in pharmacopœia building have the changes and standards and tests been published in advance of the approval of the final text. This has been done to permit anyone to frame a criticism or propose an improvement.—J. Am. Pharm. Assoc. 1914, v. 3, p. 864; also Am. Druggist, 1914, v. 62, p. 201.

Rogers, T. B.: At least one veterinarian should be added to the revision committee or veterinary surgeons should get together and issue a veterinary pharmacopœia.—Am. Vet. Rev. 1914, v. 44, p. 608.

14. NATURE AND PROGRESS OF REVISION.

Remington, J. P.: The revision of the United States Pharmacopœia. A review of the progress to date.—Pract. Drug. 1914, v. 32, p. 332–334. See also Western Druggist, 1914, v. 36, p. 69–70, Am. Druggist, 1914, v. 62, p. 89–90, and J. Am. Pharm. Assoc. 1914, v. 3, p. 429–431, 963–967.

Beal, J. H.: The method of making the Pharmacopœia of the United States.—Western Druggist, 1914, v. 36, p. 400, and Am. Druggist, 1914, v. 62, p. 447.

Editorial: Pharmacopœial revision, as carried on in this country, lacks coordination and is attended with considerable unnecessary delay due to the wide separation of the various individual revisors and the lack of a central bureau or laboratory for checking up the results of individual investigations.—N. A. R. D. Notes, 1914, v. 17, p. 1181.

Mittelbach, Wm.: A glimpse into the new Pharmacopœia, with some suggestions as to probable nature and composition.—Proc. Missouri Pharm. Assoc. 1914, p. 106–107. See also McClain, H. W.: Proc. South Dakota Pharm. Assoc. 1914, p. 45–46.

Remington, J. P.: Some of the novel features to be embodied in the U. S. P. IX.—Proc. West Virginia Pharm. Assoc. 1914, p. 64–67. See also Diekman, George C.: Proc. New York Pharm Assoc. 1914, p. 109–110.

Editorial: The general indications are that the monographs in the U. S. P. IX, will be quite an advance upon those included in the present Pharmacopœia.—Chem. & Drug. 1914, v. 84, p. 565–566.

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Anon.: Pharmacopœial revision notes, including comments on the Pharmacopœia of the United States and liberal abstracts from part 1 of the Abstract of Proposed Changes.—Year-Book of Pharmacy, 1914, p. 154–165.

a. SCOPE.

1. NATURE AND CONTENT OF THE PHARMACOPŒIA.

Editorial: As now seems probable there will be 798 articles in the new book, as compared with 958 articles in the text of the present Pharmacopœia, and 994 articles in the U. S. P. of 1890.—Pharm. Era, 1914, v. 47, p. 258.

Editorial: The two legal standards, the Pharmacopœia and the National Formulary, contain some 1,500 drugs and preparations, and, according to the best available information, these represent all that is good in medicine.—N. A. R. D. Notes, 1914, v. 19, p. 565.

Dittmeyer, W. E.: The objects of the Pharmacopœia in recent years has been to simplify it and reduce it down to simple formulas. The necessary formula is and should be kept in a separate book.—Proc. Virginia Pharm. Assoc. 1914, p. 80.

Beal, H. H.: A pharmacopœia must always follow the practice of medicine not precede it.—Western Druggist, 1914, v. 36, p. 402, and Am. Druggist, 1914, v. 62, p. 449.

Remington, J. P.: One of the important questions now before the committee of revision is will the manufacturers be willing to permit their preparations to be admitted to the Pharmacopœia with tests of purity and identity, under another name.—Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 32K. See also Proc. N. A. M. M. P. 1914, p. 32, and Am. Druggist, 1914, v. 62, p. 202.

Ransford-Gay, St. Claire, M.: If our national standards were really useful, the Pharmacopœia would not be 10 years behind the times, and the N. F. a book of poor duplicates of proprietary preparations, instead of each being a living testimonial to the professions both of pharmacy and of medicine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 432.

Cook, E. Fullerton: To the U. S. P. is conceded the right to first choose in the entire field of materia medica those substances or preparations in the eligible class.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1300.

Kreig, Arch.: Each drug, chemical and compound in the Pharmacopœia should be concisely stated. The book should be doubly indexed so that the busy physician can turn to a remedy and see for what it is useful, or turn to an index of human ills and find what remedies are available for their amelioration. Average doses should

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be given and in case of poisons the antidote and how to apply it.—Proc. West Virginia Pharm. Assoc. 1914, p. 78.

2. THE PHARMACOPŒIA AS A TEXTBOOK.

Woodruff, Charles M.: The United States Pharmacopœia is now a decennial record of some of the achievements and triumphs of manufacturing pharmacy; but it is a private enterprise.—Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 321.

Curry, Gordon L.: The Pharmacopœia and no other work is the standard and the Pharmacopœia and no other text should be used in the manufacture of official preparations.—Proc. Kentucky Pharm. Assoc. 1914, p. 56.

Hower, W. R.: The cause of much of the trouble of former years, namely, that of using old and obsolete formulas in manufacturing U. S. P. and N. F. products, seems to have been entirely eliminated.—Rep. Ohio D. & F. Div. 1914, p. 43.

Floyd, Henry B.: But two in five drug stores in the District of Columbia possess the eighth revision of the U. S. P., and but one in every five can boast of possessing the last edition of the National Formulary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 569.

Tupper, Edward A.: The rule adopted by the board to have candidates bring to the practical examination their U. S. P. and National Formulary, making preparations therefrom as directed, has been found eminently satisfactory, as this tests the candidates' ability to make preparations which should be made in every drug store.—Proc. Minnesota Pharm. Assoc. 1914, p. 56.

Hostmann, Jeannot: Necessary apparatus in a retail pharmacy. Every pharmacist should have as an adjunct to an up-to-date prescription department a complete set of chemical apparatus, such as is necessary to perform the simpler tests and assay methods of the U. S. P.—J. Am. Pharm. Assoc. 1914, v. 3, p. 697-699.

Xrayser II: In the Ph. Brit. V the general medical council has issued a book that nine-tenths of the retail trade will rarely open.—Chem. & Drug. 1914, v. 85, p. 517.

3. A LIMITED MATERIA MEDICA.

Rogers, T. B.: The tendency in certain quarters to restrict our materia medica is to be regretted.—Am. Vet. Rev. 1914, v. 44, p. 607.

Editorial: The preparations of the U. S. P. and the N. F. are bona fide, active medicinal agents, but the medical men have little knowledge of this armamentarium, the best in the world.—N. A. R. D. Notes, 1914, v. 19, p. 565.

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Wilbert, M. I.: The proposed list of useful drugs; a review with analyses of the list adopted by the council on pharmacy and chemistry of the American Medical Association.—J. Am. Pharm. Assoc. 1914, v. 3, p. 932–936.

Book Review: Handbook of Useful Drugs. The object of this book is to present a selected list of important drugs suggested for the use of teachers of materia medica and therapeutics, and to serve as a basis for the examination in therapeutics of State medical examining and licensing boards. The book represents a much needed advance in therapeutics by tacitly repudiating a large number of useless drugs.—J. Am. M. Assoc. 1914, v. 62, p. 1984.

Book review of "Useful Drugs" says, in part: "It does not require the gifts of a seer or the abilities of a prophet to venture the opinion that this rather diminutive volume of 167 pages is destined in the near future to have a decidedly far-reaching influence on the teaching and on the practice of therapeutics, and consequently is designed to have an equally important bearing on the future development of pharmacy and the efficiency of pharmacists generally."—Am. J. Pharm. 1914, v. 86, p. 45. See also Editorial: Drug. Circ. 1914, v. 58, p. 66, and Pharm. J. 1914, v. 92, p. 278.

4. NOMENCLATURE.

Rousseau, C.: A proposition for the unification of pharmaceutical nomenclature, with a table showing the language used for the main titles in the principal pharmacopœias of the world.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 195–237. See also Svensk farm. Tidskr. 1914, v. 18, p. 11–13, 27–29, 58, 76–77, 292–293.

Martin, Henri: Pharmaceutical names considered as commercial trade-marks.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 135–141.

Wilbert, M. I.: Pharmacopœial titles for new remedies. A compilation showing the titles included in several of the foreign pharmacopœias.—J. Am. Pharm. Assoc. 1914, v. 3, p. 652–655.

Rehwald, Max: Observations on chemical and pharmaceutical nomenclature and the desirability of developing names that will eliminate all doubt as to the composition of any given article or preparation.—Pharm. Ztg. 1914, v. 59, p. 143–144. See also Drug. Circ. 1914, v. 58, p. 207, and Am. Druggist, 1914, v. 62, p. 450–454.

Editorial: Complex chemical titles are inconvenient to say the least, and it would seem wise where these products are recognized in the U. S. P. that a short and concise name be devised.—Midl. Drug. 1914, v. 48, p. 564.

Remington, J. P.: We are going to have an official abbreviation after each medicine. No pharmacopœia in the world has ever had

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such a thing as an official abbreviation.—Proc. West Virginia Pharm. Assoc. 1914, p. 85; also Proc. Vermont Pharm. Assoc. 1914, p. 85–95.

Editorial: No material change has been made in the nomenclature of the Ph. Brit. V.—Pharm. J. 1914, v. 93, p. 447. See also Brit. M. J. 1914, v. 2, p. 720.

Heebner, Chas. F.: The absence of uniformity in the nomenclature of the Ph. Brit. is still almost as prominent as in the former Pharmacopœia.—Canadian Pharm. J. 1914, v. 48, p. 206.

Anon.: One novel feature of the Ph. Brit. V of which the utility is doubtful, is the appearance of an appendix of abbreviated Latin names of drugs and preparations.—Practitioner, 1914, v. 93, p. 855. See also Editorial: Lancet, 1914, v. 187, p. 902, and Brit. M. J. 1914, v. 2, p. 798.

Editorial: Pharmacopœial synonyms have given the drug trade a great deal of trouble. We hope the abbreviations included in the Ph. Brit. V may never be put forward as legally binding.—Chem. & Drug. 1914, v. 85, p. 480. See also Am. J. Pharm. 1914, v. 86, p. 560, and Oil, Paint & Drug Rep. 1914, v. 86, October 19, p. 33.

McWalter, J. C.: The Ph. Brit. V gives its sanction to such dangerous monstrosities as "lin. sap" and "æth."—Chem. & Drug. 1914, v. 85, p. 530.

McNeil, Robert: The idea suggested by the council on pharmacy and chemistry of the American Medical Association to change titles of various formulas from therapeutic to drug names is an excellent one, and its adoption by manufacturers generally would prove that the interests of the physicians are paramount.—Proc. Am. Assoc. Pharm. Chem, 1914, p. 186.

Gordon, Frederick T.: The nomenclature of the homœopathic Pharmacopœia of the United States seems unsystematic, as there are several different terminations used for metals and no attempt is made to distinguish by termination or form between alkaloids, glucosides, or other organic salts.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1712.

5. PUBLICITY.

Remington, J. P.: For the first time in pharmacopœial revision an abstract of changes in standards is being published in advance in the Journal of the American Pharmaceutical Association and other journals.—Proc. West Virginia Pharm. Assoc. 1914, p. 66; also J. Am. Pharm. Assoc. 1914, v. 3, p. 429, 866, and Pract. Drug. 1914, v. 32, p. 333.

Lattimer, George W.: The committee of revision of the U. S. P. is to be commended on the methods used for publicity, by publishing in the drug, chemical, and medical journals abstracts of the different sections, in order to secure suggestions and comments from those generally interested throughout the country.—Proc. N. W. D. A.

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1914, p. 29. See also Proc. New York Pharm. Assoc. 1914, p. 108–109, and Mittelbach, Wm.: Proc. Missouri Pharm, Assoc. 1914, p. 106.

Mayer, Joseph: The committee of revision should issue lists of items to be included in the U. S. P. more frequently.—J. Am. Pharm. Assoc. 1914, v. 3, p. 460.

Remington, J. P.: This is the first instance in the world where a new pharmacopœia has been published in the pharmaceutical journals practically before the book was issued.—Proc. N. A. M. M. P. 1914, p. 32; also Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 32J.

Editorial: The preface to the Pharmacopœia should receive wide publicity in order that the best trained minds in the pharmaceutical profession may be given an opportunity to criticize it constructively.—Pract. Drug. 1914, v. 32, p. 324.

Remington, J. P.: An Abstract of Proposed Changes with New Standards and Descriptions, Part 2.—J. Am. Pharm. Assoc. 1914, v. 3, p. 359–416, Part 3, p. 524–552, Part 4, p. 984–997, Part 5, p. 1100–1110, Part 6, p. 1563–1583; also as reprints.

Part 1 of the Abstract of Proposed Changes with New Standards and Descriptions for the U. S. P. IX is reprinted.—Merck's Rep. 1914, v. 23, p. 12ff. See also Pacific Drug Rev. 1914, v. 26, February, p. 18ff.

6. TIME OF PUBLICATION.

Remington, J. P.: The revision of the U. S. P. VIII is nearing completion and the U. S. P. IX will undoubtedly be in the hands of the publishers this year, possibly by July 1.— J. Am. Pharm. Assoc. 1914, v. 3, p. 461. See also Am. J. Pharm. 1914, v. 86, p. 290.

Editorial: An important announcement made at the meeting of the American Pharmaceutical Association at Detroit was that the revised U. S. P. might be expected early next year.—Western Druggist, 1914, v. 36, p. 371. See also Bull. Pharm. 1914, v. 28, p. 135.

Fleissig: The United States Pharmacopœia is expected to be available for distribution at the end of 1914 or the beginning of 1915.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 253. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 43.

Wilson, R. C.: We are on the eve of a new U. S. P. and N. F. which will in all probability make their appearance within the next few months.—Proc. Georgia Pharm. Assoc. 1914, p. 25.

Diekman, George C.: Concerning the actual date when the U. S. P. IX will be at hand and when its text will become authoritative no definite statement can as yet be made.—Proc. New York Pharm. Assoc. 1914, p. 108.

Vanderkleed, Charles E.: The report of the committee on drug market probably represents the last one based on the U. S. P. VIII.—Drug. Circ. 1914, v. 58, p. 426.

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7. DOSES.

Editorial: The practice of specifying doses in the Pharmacopœia has the advantage of providing for the public an additional safeguard against possible error.—Pharm. J. 1914, v. 92, p. 131.

Editorial: Pharmacopœia doses. Official doses are a bugbear and at best are only a guide in treatment.—Prescriber, 1914, v. 8, p. 73–75.

Leptvich, R. W.: On uniformity of doses. The arrangement of doses in the Pharmacopœia is characterized by an utter lack of system.—Proc. Roy. Soc. Med. Therap. & Pharmacol. Sec. 1914, v.7, p. —.

Hawthorne, C. O.: Some suggested amendments in the manner of stating the doses of medicines in the British Pharmacopœia.—Lancet, 1914, v. 186, p. 231–233. See also Am. Druggist, 1914, v. 62, p. 294, Lancet, 1914, v. 186, p. 357, Pharm. J. 1914, v. 92, p. 131, and Chem. & Drug. 1914, v. 84, p. 184–185.

Editorial: The doses in the Ph. Brit. V are not authoritative, but are merely intended for guidance.—Brit. M. J. 1914, v. 2, p. 635. See also Lancet, 1914, v. 187, p. 907, and Med. Rec. 1914, v. 86, p. 766.

Dreyer and Walker: The dosage of drugs, toxins, and antitoxins.—Proc. Roy. Soc. Med. Therap. & Pharmacol. Sec. 1914, v. 7, p. 51–72. See also Lancet, 1914, v. 186, p. 1023–1027.

Luff, Arthur P.: The thorough knowledge of the doses of drugs is essential to success in the art of prescribing. Learn your doses well.—Brit. M. J. 1914, v. 1, p. 634.

Anon.: A posological table giving the maximum dose for infants, children, and the aged.—Meyer Bros. Drug. 1914, v. 35, p. 47. See also Therap. Gegenw. 1914, v. 55, p. 205–207.

Briggs, C. H.: The two principal methods of giving liquids is by teaspoonfuls and by drops. It is safe to say that one man's conception of a teaspoonful may be twice that of another.—J. Am. Pharm. Assoc. 1914, v. 3, p. 31.

Jürs, Manning H.: The Pharmacopœia should publish the minimum lethal dose of all poisons. The average doses as given at present are of little value to the pharmacist.—Drug. Circ. 1914, v. 58, p. 95–96.

Hatcher and Eggleston: No rule can be formulated for the calculation of the appropriate dose by one mode of administration from the dose by any other mode of administration. Such determination can be made only by experiment.—J. Am. M. Assoc. 1914, v. 63, p. 473.

Peck, E. Saville: A discussion of the course to be adopted when the dose prescribed is apparently excessive, that is above the pharmacopœial maximum.—Year-Book of Pharmacy, 1914, p. 420.

For additional comments on dosage see Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.; Pharm. J.; and Lancet.

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8. ANTIDOTES.

Kreig, Arch.: In the case of poisons, the Pharmacopœia should include mention of the antidotes and how to apply them.—Proc. West Virginia Pharm. Assoc. 1914, p. 78.

Editorial: Many of the labels used by druggists on poisons name antidotal measures which are entirely inadequate and insufficient for the purpose required, while some labels call for remedial measures or the use of means that are absolutely inaccessible to the average person.—Pharm. Era, 1914, v. 47, p. 3.

Anon.: A list of the commonly used poisons with their antidotes.—Meyer Bros. Drug. 1914, v. 35, p. 114.

Lyman, Rufus A.: Toxicological problems of interest to druggists. The treatment of cases of poisoning is a biological rather than a chemical study. Chemical antidotes have probably done more harm than good.—Southern Pharm. J. 1914, v. 6, p. 296–297, 339–340.

Carter, Thomas A.: A new bichloride antidote, a combination of phosphorous acid, acetic acid, and sodium bicarbonate.—Drug. Circ. 1914, v. 58, p. 284.

Editorial: The antagonisms of poisons, with special reference to the work of J. N. Langley.—Med. Rec. 1914, v. 85, p. 1033.

9. WEIGHTS AND MEASURES.

Fischer, Louis A.: Recent developments in weights and measures in the United States.—Pop. Sci. Month. 1914, v. 84, p. 345.

Stratton, S. W.: Report of the proceedings of the Ninth Annual Conference on Weights and Measures of the United States, Department of Commerce, Bureau of Standards, Washington, D. C. See also Am. Food J. 1914, v. 9, p. 262–264.

Editorial: Drug store weights are receiving much notice in the daily press, especially in Massachusetts.—Drug. Circ. 1914, v. 57, p. 603.

Lincoln, Burr B.: A report on the inspection of weights and measures in Michigan.—Rep. Michigan D. & F. Com. 1914, p. 210–215. See also Michigan Weights and Measures Law, p. 206–210, and Albrecht, Fred C.: Rep. Ohio D. & F. Div. 1914, p. 54–61.

Allen, R. M.: An investigation is to be made, among pharmacists, into the weights and measures used in filling prescriptions.—Rep. Kentucky Agric. Exper. Sta. 1911–1913, Lexington, 1914, p. 3.

Downing, F. P.: Druggists' scales and prescriptions glasses, contrary to the general opinion, are quite inaccurate.—Oil, Paint & Drug Rep. 1914, v. 85, June 1, p. 35.

Porter, C. S.: Out of 142 avoirdupois weights tested, only a few varied from the standard, while out of 632 apothecary weights tested,

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262 were defective, mostly below standard, though one or two ran a little too high.—Proc. Kentucky Pharm. Assoc. 1914, p. 112.

Floyd, Henry B.: Many pharmacists use the avoirdupois and apothecary's ounces interchangeably without regard to their difference of 42½ grains.—J. Am. Pharm. Assoc. 1914, v. 3, p. 570.

Baillehache, R.: On the definition of a liter and the density of water in the metric system.—Ann. Phys. Paris, 1914, v. 1, p. 344–346.

Alsberg, C. L.: The term "dram."—S. R. A.-Chem. 1914, p. 528. See also Mitchell, A. S.: p. 311.

Brewer, J. Ed.: The Philadelphia branch of the American Pharmaceutical Association believes that the word "dram" should be held to mean one-eighth of an apothecary's (or Troy) ounce and not one-sixteenth of an avoirdupois ounce.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1746.

Arny, H. V.: Report for the committee on weights and measures of the American Pharmaceutical Association.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1274.

Editorial: The metric carat has been accepted by Great Britain, so that now practically every country in the world recognizes 200 mg. as the unit of weight for precious stones.—Drug. Circ. 1914, v. 58, p. 5.

Stratton, S. W.: Units of weights and measures, with definitions and tables of equivalents. Also a résumé of the status of the international metric system in the United States.—Circ. Bur. Stand. No. 47, p. 68.

Siemens, Alexander: The metric system; a review.—Sc. Am. Suppl. 1914, v. 78, p. 6.

Stoll, Max: The weights and measures used in Germany.—Pharm. Ztg. 1914, v. 59, p. 901–902, 918–919.

Richards, William J.: The metric system of weights and measures is gradually gaining in favor and will eventually replace the other systems.—Bull. Pharm. 1914, v. 28, p. 456. See also Comstock, H. M., p. 456–457.

Young, E. F.: It would be a great convenience to working pharmacists if some firm would bring out a set of metric weights to include units for 2, 4, 6, and 8 grams. The usual sets for 1, 2, 5, 10, 20 grams and upward in a decimal scale are not very convenient for many of the quantities we require.—Pharm. J. 1914, v. 93, p. 890.

Mack, Jay: The Ph. Brit. V. and the metric system.—Chem. & Drug. 1914, v. 85, p. 647. See also Gadd, H. Wippell: Pharm. J. 1914, v. 93, p. 494.

Wilbert, M. I.: Metric weights and measures only are used in the Ph. Brit. V. for making or testing official products; the term "mil" is recognized as a short official designation to be used in place of the

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more cumbersome cubic centimeter.—Am. J. Pharm. 1914, v. 86, p. 559.

Editorial: The term "mil" was first introduced by the late Prof. Oscar Oldberg in his "Unofficial Pharmacopœia," published in 1881.—Am. Druggist, 1914, v. 62, p. 403.

Woods, Chas. D.: The minor errors of preparations are due to poor graduates and scales aggravated by unfamiliarity with the metric system of weights and measures that are used in the official directions.—Off. Insp. Maine Agric. Exper. Sta. 1914, No. 61, p. 103.

Porterfield, W. P.: Although glass manufacturers guarantee their graduates to deliver definite amounts, this is not always true, for there is no graduate made that is capable of delivering equal amounts of all liquids that are measured in the drug store.—Proc. North Dakota Pharm. Assoc. 1914, p. 78.

Anon.: An illustrated description of a new method of marking measuring glasses.—Pharm. Zentralh. 1914, v. 55, p. 183–184.

10. OBJECTS AND USES.

Remington, J. P.: A pharmacopœia can never be an exploiter of new and untried remedies. The Pharmacopœia must be a book of standards.—Am. Druggist, 1914, v. 26, p. 201.

Beal, J. H.: Relations of the United States Pharmacopœia to the law and to the general public.—Am. Druggist, 1914, v. 62, p. 447–449.

Noyes, C. R.: To secure reasonably pure products the best and safest thing for the retail druggist to do is to specify "U. S. P." on every article included in that book.—Proc. Minnesota Pharm. Assoc. 1914, p. 187; also J. Am. Pharm. Assoc. 1914, v. 3, p. 605.

Vanderkleed, Charles E.: It is safe to predict that the U. S. P. IX, with its improvements in descriptions, its more definite though eminently fair and reasonable requirements, and with the largely changed attitude with which it will be received alike by all interests, an even greater conformity to standards will be the result at the end of another decade.—Drug. Circ. 1914, v. 58, p. 426.

Porter, C. S.: Out of 57 stores visited at Mount Sterling, Lexington, and Louisville, 9 were found not to have a copy of the Pharmacopœia, while 31 had metric weights and 35 metric graduates.—Proc. Kentucky Pharm. Assoc. 1914, p. 112.

Floyd, Henry B.: It is safe to say that but one in eight of the drug stores in the District of Columbia can boast of both the U. S. P. and N. F.—Western Druggist, 1914, v. 36, p. 178.

Anon.: Druggists should not be afraid to use the Pharmacopœia. It is the official guide in pharmacy and the more they use it the better they will like it.—N. A. R. D. Notes, 1914, v. 17, p. 1027.

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Raubenheimer, Otto: Do not hide your copies of the U. S. P., N. F., dispensatories, and other standard pharmaceutical works, but keep them in a prominent place so you can readily consult them.—Proc. New Jersey Pharm. Assoc. 1914, p. 34.

11. ADDITIONS AND DELETIONS.

Remington, J. P.: The Pharmacopœial Convention disapproved of the admission of patented or proprietary preparations, mainly on the ground that everything in the Pharmacopœia should be free and open to all.—Pract. Drug. 1914, v. 32, p. 333; also J. Am. Pharm. Assoc. 1914, v. 3, p. 865, and Am. Druggist, 1914, v. 62, p. 202.

Raubenheimer, Otto: The new Pharmacopœia will contain a number of synthetic remedies. The revision committee, however, has decided not to introduce such which are still protected by patent rights.—Proc. New York Pharm. Assoc. 1914, p. 172; also Pract. Drug. 1914, v. 32, p. 349.

Editorial: Manufacturers are against the "recognition" of their proprietary products in the U. S. P. on the ground that they would lose control of their composition, and on the further ground that property rights would in a sense be taken away from them.—Bull. Pharm. 1914, v. 28, p. 135.

Rogers, T. B.: Considerable pressure is being brought upon the committee of revision of the Pharmacopœia to the end that they remove useless or inert remedies from its pages.—Am. Vet. Rev. 1914, v. 44, p. 607.

Diekman, George C.: It is expected that the ninth revision of the Pharmacopœia will include only 798 separate and distinct items. Two hundred and twenty-four substances or articles now official have been dropped by the subcommittee on scope, and 64 new substances or articles have been added.—Proc. New York Pharm. Assoc. 1914, p. 108.

Anon.: The deletions from the Ph. Brit. include a stately list of 168 items, 45 of which were formerly in the Indian and Colonial Addendum. The crude drugs number 51, chemicals 17, and galenical preparations 98.—Pharm. J. 1914, v. 93, p. 453. See also Gadd, H. Wippell, p. 494.

12. PURITY AND STRENGTH.

Remington, J. P.: The formulation of a purity rubric for each chemical medicament would be a most important function for a separate international commission.—Compt. rend. Congr. Internat. Pharm. 1913, v. 1, p. 518.

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Editorial: The definitions of the U. S. P. should be so worded that there can be but one interpretation of their meaning.—Pacific Pharm. 1914, v. 8, p. 40.

Todd, A. R.: The crying need of the U. S. P. is a clear, concise definition for each preparation, giving a minimum and maximum standard for the principal ingredients and a method for their determination.—Rep. Michigan D. & F. Com. 1914, p. 191.

Havenhill, L. D.: Since the U. S. P. is a legal standard the plea has been made that its language be as free as possible from relative qualifying words of the character of "faint," "slight," "moderate," "about," etc., unless the same be properly defined in an appropriate place.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1301.

Anon.: A table showing the limits of the proportion of lead or of arsenic permissibly present as an impurity in many pharmacopœial substances.—Pharm. J. 1914, v. 93, p. 455.

Hill, C. A.: Pharmaceutical chemical standards, with a table showing the contaminations found in various chemicals and the amount of lead and arsenic found in parts per million, during the years 1910 to 1913, inclusive.—Chem. & Drug. 1914, v. 85, p. 17–23.

Mann, E. W.: The Ph. Brit. V lays down certain minimum standards for crude drugs.—Ann. Rept. Southall Bros. & Barclay, 1914, p. 5.

Anon.: The fixing of definite standards of purity and definite limits of impurity in the Ph. Brit. V is an excellent step, but the manner in which it is set out leaves much to be desired.—Chem. & Drug. 1914, v. 85, p. 609.

Fernau, Albert: In testing chemicals for purity, it is important to determine the nature of the contaminations.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 275.

Vanderkleed, C. E.: Lack of uniformity has resulted because of the absence of cooperative standards among manufacturers.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 127.

van der Haar, A. W.· Codification of the purity requirements for chemical products.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 646–648. See also Bührer, C.: p. 643–645.

Berl, E.: The unification of standards for volumetric solutions; their production, use, and purity.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 649–654.

For condensed table of chemical impurities see Evans' An. Notes, 1914, p. 91.

18. ATOMIC WEIGHTS.

Clarke and others: Annual report of the international committee on atomic weights and the atomic weights table for 1914.—Bull. Soc. chim. France, 1914, v. 15, Insert in No. 15; also Ber. deutsch. Chem.

Digitized by Google

Gesellsch. 1914, v. 47, p. 8–11, and Ztschr. anorg. Chem. 1914, v. 84, p. 273–276.

Clarke and others: Annual report of the international committee on atomic weights, 1915, with the international atomic weights table for that year.—J. Am. Chem. Soc. 1914, v. 36, p. 1585–1589; also J. Chem. Soc. Lond. 1914, v. 105, p. 2577–2580, Ber. deutsch. pharm. Gesellsch. 1914, v. 9, p. 527–531, and other journals.

Kindscher, E.: Report on atomic weight investigations November, 1912, to November, 1913.—Fortschr. Chem. 1914, v. 9, p. 1–14.

Wolff, Frank A.: In the eighth revision of the Pharmacopœia the table of atomic weights based upon hydrogen=1 is in use. For the sake of uniformity and convenience, no doubt, the new international basis will be adopted in the U. S. P. IX.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1431.

Heebner, Chas. F.: The list of atomic weights in the Ph. Brit. V is based upon the weight of oxygen taken as 16, with hydrogen as 1.008.—Canadian Pharm. J. 1914, v. 48, p. 204. See also Brit. M. J. 1914, v. 2, p. 635.

Eve, A. S.: Modern views on the constitution of the atom.—Science, 1914, v. 40, p. 115–121.

Rutherford, E.: The structure of the atom.—Nature, 1914, v. 92, p. 423. See also Soddy, p. 399, 452, and van den Broek, A., v. 93, p. 241–242.

Richards, Theodor W.: The present aspect of the hypothesis of compressible atoms.—J. Am. Chem. Soc. 1914, v. 36, p. 2417–2439.

Falk, K. George: Some further consideration of the development of the electron conception of valence.—Proc. Am. Philosoph. Soc. 1914, v. 53, p. 25–30.

Stewart, G. W.: The content and the structure of the atom. Portion of an address in which the subject is reviewed.—Science, 1914, v. 40, p. 661–663.

Loring, F. H.: A note on the question of associate atoms.—Chem. News, 1914, v. 110, p. 25–26.

For additional references see Chem. Abstr.; J. Chem. Soc. Lond.; and Chem. Zentralbl.

14. CHEMICAL FORMULAS.

Anschütz, Richard: A review of the evolution of graphic chemical formulas.—Pharm. Post, 1914, v. 47, p. 438–439.

Bates, Stuart J.: The electron conception of valence. Some of the objections that may be raised against the electron conception of valence.—J. Am. Chem. Soc. 1914, v. 36, p. 789–793.

Gadd, H. Wippell: The Ph. Brit. V. does not retain the constitutional formulas which pleasantly broke the monotonous regularity of

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the pages of the 1898 volume.—Pharm. J. 1914, v. 93, p. 494. See also Heebner, Chas. F.: Canadian Pharm. J. 1914, v. 48, p. 204.

Anon.: The chemical nomenclature and formulas employed in the Ph. Brit. V are in accordance with general usage; constitutional but not graphic formulas are given for many organic substances.—Pharm. J. 1914, v. 93, p. 495.

Crabbé, Maurice: The relations existing between the chemical structure and therapeutic properties of various substances.—J. pharm. Anvers, 1914, v. 70, p. 161–183.

3. NONPHARMACOPŒIAL STANDARDS.

1. NATIONAL FORMULARY.

Cook, E. Fullerton: With the publication of the fourth edition of the N. F. this book enters upon a new era. For the first time it has been revised with the purpose in view of serving as a standard under the food and drugs act.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1299.

Remington, J. P.: The National Formulary, which is now a legal standard, will contain a large addition of new pharmacopœial preparations, and it is now hoped that the two books will be issued within a few months of each other.—Proc. West Virginia Pharm. Assoc. 1914, p. 67.

Whelpley, H. M.: The manuscript of the National Formulary is practically ready, but the book will not be placed on the market until the U. S. P. IX is ready.—Proc. Missouri Pharm. Assoc. 1914, p. 127.

Anon.: The fourth edition of the National Formulary will be divided into two parts. Part 1 will contain the formulas proper and Part 2 will contain monographs of standards for those drugs which are not official in the U. S. P. IX, but which enter N. F. preparations.—Pract. Drug. 1914, v. 32, p. 412.

Beringer, George F.: Report of committee on unofficial standards, including a number of monographs proposed for inclusion in the N. F. IV.—J. Am. Pharm. Assoc. 1914, v. 3, p. 873–879.

Whelpley, H. M.: The National Formulary, like the Pharmacopœia, should be designated by revision.—Proc. Missouri Pharm. Assoc. 1914, p. 127; also Meyer Bros. Drug. 1914, v. 35, p. 211.

Glover, William H.: The National Formulary and U. S. Pharmacopœia contain many formulas of merit.—Proc. Massachusetts Pharm. Assoc. 1914, p. 116.

Hague, George W.: The National Formulary should include formulas for all preparations that are in use regardless of their probable therapeutic value so as to insure uniform preparations.—Merck's Rep. 1914, v. 23, p. 33.

Norwood, T. W.: Suggestions for improving some of the preparations of the Pharmacopœia and National Formulary.—Drug. Circ.

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1914, v. 38, p. 390. See also Amos, W. S.: J. Am. Pharm. Assoc. 1914, v. 3, p. 322–325.

Woodruff, Charles M.: The original purpose of the National Formulary was to teach pharmacists how they may make extemporaneously in their drug stores the various pharmaceutical mixtures which have become popular with the medical profession.—Proc. N. A. M. M. P. 1914, p. 150; also Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 321.

Beringer, George M.: With the appearance of the new edition of the National Formulary, the first prepared as a legal standard, its importance will be increased and the sale should be very extensive.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1231.

Needham, R. H.: In the curricula of medical schools there is neither time nor place for the National Formulary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1168.

Raubenheimer, Otto: Bibliography of formularies accompanying the paper entitled foreign formularies as compared with the National Formulary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 959–960.

Anon.: Article 32 of the regulations for the practice of pharmacy in the Republic of Cuba accepts the National Formulary as a book of standards.—Farm. Españ. 1914, v. 46, p. 68.

2. RECEIPT BOOK.

Hynson, Hy. P.: Report of the committee on receipt book with a number of recommendations, in regard to prospective scope and character and a list of articles, formulas for which might be taken out of the N. F. and included in the receipt book.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1302–1308. See also Raubenheimer, Otto, p. 189–190.

Kisker, F. W.: Instead of adding to the long list of worthy ethical preparations which are hard to improve upon, it would appear advisable that pharmacists adopt some method to popularize U. S. P. and N. F. preparations with physicians.—Midl. Drug. 1914, v. 48, p. 360.

Anon.: A number of formulas for household remedies and cosmetics and other useful preparations.—Canadian Pharm. J. 1914, v. 48, p. 174.

Anon.: A list of formulas for therapeutically active combinations and for pharmaceutical specialties.—Vrtljschr. prakt. Pharm. 1914, v. 11, p. 50–80, 152–184, 251–275, 315–317.

Editorial: In cases where the druggist does not care to preserve all the reading matter which his periodicals offer him, he should clip formulas and preserve them in a scrapbook.—Nat. Druggist, 1914, v. 44, p. 331.

Editorial: A review of the New Era Formulary, a book containing nearly 8,000 formulas, designed to appeal to the manufacturer,

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the pharmacist, the physician, the veterinarian, and to workers in all departments of professional, industrial, and household economics.—Pharm. Era, 1914, v. 47, p. 147.

A book review calls attention to "Pharmaceutical Formulas," by Peter MacEwan.—Drug. Topics, 1914, v. 29, p. 13.

Searle, C. H.: Report of the committee on formulas to be discarded, with a number of suggestions for eliminating complex formulas from price lists of manufacturers.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 180–184. See also Snider, H. F., p. 193–197.

8. NEW AND NONOFFICIAL REMEDIES.

Anderson, John F.: The work of the council on pharmacy and chemistry of the American Medical Association, while a step in the right direction, should be further elaborated by securing authoritative information from those in position to furnish it regarding the status and value of new products.—J. Am. M. Assoc. 1914, v. 63, p. 2.

Puckner, W. A.: The council on pharmacy and chemistry of the American Medical Association; a review of its history and accomplishments.—Therap. Monatsh. 1914, v. 28, p. 178–185.

Heubner, W.: The German Congress for Internal Medicaments; a review of its accomplishments.—Therap. Monatsh. 1914, v. 28, p. 185–190.

Osseward, Cornelius: The vigorous warfare which has been waged by the American Medical Association the last few years against various mixtures, has no doubt reduced the use of many of these ready-made mixtures.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1558.

Roemer, John: The need of authority for nonofficial medicaments.—J. Am. Pharm. Assoc. 1914, v. 3, p. 259–260.

A book review of New and Nonofficial Remedies says that this book is a valuable work of reference which gives the gist of what is known about a great number of well-known remedies and medicinal agents.—Pharm. J. 1914, v. 92, p. 576.

A book review calls attention to New and Nonofficial Remedies, particularly to the inclusion of bibliographical references to a number of preparations which have not been accepted by the council, but which have been commented upon in the other publications of the American Medical Association.—Drug. Circ. 1914, v. 58, p. 225.

SYNTHETICS.

Raubenheimer, Otto: The "tar barrel" has not yielded as many remedies as in former years.—Pract. Drug. 1914, v. 32, p. 349.

Rosenthaler, L.: Enzymatic synthesis and the problems involved.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 437–440.

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Herzog, O. R.: The synthesis of alkaloids in the production of new remedies. A review.—Pharm. Post, 1914, v. 47, p. 137.

Sayre, L. E.: A list of synthetic remedies included in the several recent pharmacopœias.—Proc. Kansas Pharm. Assoc. 1914, p. 34–38.

Anon.: The English law requiring the operation within that country of any process patent issued in order to maintain its validity has not worked out to the advantage of the consumers of articles in England.—Phys. Drug News, 1914, v. 9, p. 344.

Apple, Franklin M.: A number of causes are responsible for the self-medication by the laity with the newer synthetic remedies.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 287.

NEW REMEDIES.

Anselmino, O.: A comprehensive review of the new remedies introduced during the year 1913.—Ber. Pharm. Gesellsch. 1914, v. 24, p. 101–123; also Arb. pharm. Inst. Univ. Berl. 1914, p. 3–24.

Raubenheimer, Otto: Report of the committee on new remedies of the New York State Pharmaceutical Association.—Pract. Drug. 1914, v. 32, p. 249–250; also Proc. New York Pharm. Assoc. 1914, p. 170–174. See also p. 221–266.

Rabow, S.: A review of the therapeutic novelties introduced during the year 1913, including specialties and secret remedies.—Chem.-Ztg. 1914, v. 38, p. 305, 319, 387, 410, 427, 479, 506, 540, 547. See also Flury, Ferdinand: Ztschr. ang. Chem. 1914, v. 27, p. 410–422.

Zernik, F.: A review of new remedies, specialties and secret remedies.—Deutsch. med. Wchnschr. 1914, v. 40, p. 964–965; also Südd. Apoth.-Ztg. 1914, v. 54, p. 26–27, 44–45, 52–53.

Fleissig: A compilation in the form of a table of the properties, uses, source, and literature regarding some of the newer remedies.—Schweiz. Apoth. Ztg. 1914, v. 52, p. 98–100, 135–137. See also Mentzel, H.: Pharm. Zentralh. 1914, v. 55, p. 716–720.

Anon.: A number of new remedies are reported on and described under the general heading "The modern materia medica."—Drug. Circ. 1914, v. 58, p. 20ff. See also Pharm. Era, 1914, v. 47, p. 9ff, Merck's Rep. 1914, v. 23, p. 17–19, and Pharm. Weekblad, 1914, v. 51, p. 193.

Book review of a volume by H. Bocquillon-Limousin on new remedies, 1914.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 286.

Anon.: Trade names of new remedies. An index list of synthetic drugs compiled from various sources.—Am. Druggist, 1914, v. 62, p. 450–454.

Anon.: A book review calls attention to a new edition of Gehe's Codex, describing new remedies and cosmetic preparations.—Südd. Apoth.-Ztg. 1914, v. 54, p. 288.

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J. D. Riedel, A.-G.: An alphabetical list giving the names of new remedies, with data regarding composition, properties and uses of some of the newer remedies, specialties and products introduced during the period 1908–1913.—Riedel's Mentor, 1914, p. 135–457.

A book review calls attention to a volume by Paul Siedler on the chemical medicaments of the last 113 years.—Therap. Monatsh. 1914, v. 28, p. 664.

Golaz, H.: The pharmacist's responsibility in connection with the exploitation and sale of new remedies and the need for careful regulations of the nomenclature, chemical composition and purity of new remedies.—Bull. Assoc. Gén. Syn. Pharm. France, 1914, v. 6, p. 27–30.

Anon.: A list of synthetic drugs and new drugs compiled chiefly from the extra pharmacopœia by Martindale and Westcott.—J. Soc. Chem. Ind. 1914, v. 33, p. 1028–1034.

Stephenson, Thos.: Compilation of a list of new remedies introduced during 1913–14.—Year-Book of Pharmacy, 1914, p. 154–165.

Mannich, C.: The vagaries of the modern new remedy production.—Münch. med. Wchnschr. 1914, v. 61, p. 1402–1404.

Cloetta, M.: Progress in pharmacotherapy during the year 1913. A review of new remedies with references to the literature on the subject.—Deutsch. med. Wchnschr. 1914, v. 40, p. 214–216, 282–285.

Lobeck, A. K.: The Propaganda for Reform in Proprietary Medicines, a bound volume of reprints which might well be called "A study in the psychology of advertising worthless products."—Am. J. Pharm. 1914, v. 86, p. 40–42.

PATENTS AND TRADE-MARKS.

Grosvenor, W. M.: The relation of the manufacturer to our patent system. A review of the practical working of the several patent systems and the conclusion that safety in the future lies in the preservation and perfection of the United States patent system.—Tr. Am. Inst. Chem. Eng. 1914, v. 6, p. 111–136. See also Oil, Paint & Drug Rep. 1914, v. 85, January 19, p. 34–35, and January 26, p. 35–36.

Ewing, Thomas: The work and needs of the United States Patent Office.—Sci. Am. 1914, v. 111, p. 491.

Stewart, F. E.: Report of the committee on patents and trademarks, including a number of recommendations.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1521–1523. See also p. 675–686, and Proc. Pennsylvania Pharm. Assoc. 1914, p. 75–78.

Osseward, Cornelius: The trade-mark evil of medicinal compounds.—J. Am. Pharm. Assoc. 1914, v. 3, p. 67–71.

Martin, Henri: Pharmaceutical names considered as commercial trade-marks.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 135–141.

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White, Edmund: Trade-marks and trade names, with a recommendation to the amendment of the patent and trade-mark laws.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 142–153.

Anon.: A table of trade names for new remedies with the corresponding chemical names or titles.—Svensk farm. Tidskr. 1914, v. 18, p. 11–13, 27–29, 58, 76–77, 292–293.

Salzman, H.: The influence of trade-mark laws on pharmacy. The author concludes that a trade-mark should not be allowed for a medicine. If allowed, only a distinctive trade-mark or sign should be permitted.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 109–114. An alphabetical list of the German marks granted from July 31, 1910, to December, 1912, is appended.—p. 115–134.

Katz, B. Alexander: Letters and figures as trade-marks.—Ztschr. ang. Chem. 1914, v. 27, p. 63–64.

Fernald, F. K.: Report of the committee on trade-marks of the N. W. D. A.—Proc. N. W. D. A. 1914, p. 201–210.

Toch, Maximilian: The present patent situation; a review.—J. Ind. & Eng. Chem. 1914, v. 6, p. 677–678.

Baekeland, L. H.: Some aspects of industrial chemistry, the creation of the French patent system, and its influence on the development of industrial chemistry.—J. Ind. & Eng. Chem. 1914, v. 6, p. 769–778.

Editorial: The patent rights on a number of familiar patent products have expired or are about to expire. Since these products will be public property after the dates indicated, American firms should lose no time in undertaking their manufacture.—J. Am. M. Assoc. 1914, v. 63, p. 693.

German, Austrian, Swiss, French, and British patents relating to chemical subjects are published as supplements to Chemische Zeitschrift. Also reports of court decisions relating to patents and trademarks.—Chemistche Zeitschrift, Berlin, 1914, v. 13.

French patents are abstracted in La Revue de Chimie Industrielle.

For American and British patents see Chem. Abstr. and J. Soc. Chem. Ind.

CHEMOTHERAPY.

Talbot, Henry P.: Ehrlich's Chemotherapy. How his logical, systemetic campaign against certain diseases has demonstrated the value of scientific methods in therapeutical problems.—Am. J. Pharm. 1914, v. 86, p. 25–30.

Bertheim, A.: A report of progress in the chemistry and chemotherapy of arsenic.—Pharm. Post, 1914, v. 47, p. 435–436.

Ritz, H.: Several fundamental principles in chemotherapy.—Berl. klin. Wchnschr. 1914, v. 51, p. 921–923.

Schwenk, Erwin: The basis and the present-day status of chemotherapy.—Pharm. Post, 1914, v. 47, p. 41. See also book review: Ber. pharm. Gesellsch. 1914, v. 24, p. 74.

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Spröngerts, E.: The foundation and the success of chemotherapy; a review.—D.-A. Apoth.-Ztg. 1914, v. 35, p. 114–115, 130–131.

Hahn and Kostenbader: Toxicologic and therapeutic investigations on dyes containing mercury.—Ztschr. Chemotherap. 1914, v. 2, p. 71–105.

Gebhardt, Kurt: On the importance and value of light in chemotherapy.—Pharm. Post, 1914, v. 47, p. 436–437.

Baermann, G.: The chemotherapy of pneumococcus pneumonia.—Ztschr. exper. u. Path. u. Therap. 1914, v. 15, p. 476–497. See also Morgenroth, J.: Berl. klin. Wchnschr. 1914, v. 51, p. 1829–1835, 1865–1873.

Wells, De Witt, and Cooper: Studies on the chemotherapy of tuberculosis.—Ztschr. Chemotherap. 1914, v. 2, p. 110–127.

Sacharoff and Nikanoroff: On several so-called chemotherapeutic preparations of a biological type.—Ztschr. Immun. u. exper. Therap. 1914, v. 21, p. 584–597.

For additional comments on chemotherapy see Index Med.; J. Am. M. Assoc.; Zentralbl. Biochem. u. Biophys.; Zentralbl. exper. Med.

RADIOACTIVITY.

Puckner, W. A.: Radium and radium salts.—J. Am. M. Assoc. 1914, v. 62, p. 41. See also v. 63, p. 2289.

Miller, Isador: Sources, properties, and uses of radium. A review of the history of radium, radioactivity and radium substances.—Am. Druggist, 1914, v. 62, p. 7.

Anderson-Tesch, Hj.: The radioactive elements of nature.—Svensk farm. Tidskr. 1914, v. 18, p. 489–495, 505–507, 537–546.

Keller, Harry F.: The chemistry of the radio elements.—Merck's Rep. 1914, v. 23, p. 87–88; also Western Druggist, 1914, v. 36, p. 104–105.

Lind and Whittemore: Observations on the constancy of the ratio of radium to uranium and the uranium minerals and its significance in the theory of the origin of radium.—J. Am. Chem. Soc. 1914, v. 36, p. 2066–2084.

Richards and Lembert: The atomic weight of lead of radioactive origin.—J. Am. Chem. Soc. 1914, v. 36, p. 1329–1344.

Fernau, Albert: A review of the chemical and physical properties of radium.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 111, 121, 137, 153.

Neumann, E.: Radioactive drugs and the determination of their radioactivity.—Compt. rend. Congr. Internat. Pharm. 191, v. 1, p. 483–486.

Engler, Sieveking and Koenig: Additional contributions on the accurate measuring of radioactivity of mineral springs.—Chem.-Ztg. 1914, v. 38, p. 425, 446.

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Moore and Whittemore: The radioactivity of the waters of Saratoga Springs, N. Y.—J. Ind. & Eng. Chem. 1914, v. 6, p. 552–553.

Schieffelin, Wm. Jay: Uniformity in dosage of radium emanation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1649–1655.

Moore, Richard B.: The radioactivity of some type soils of the United States.—J. Ind. & Eng. Chem. 1914, v. 6, p. 370–374.

Oddo, Giuseppe: The molecular structure of the radioactive atom.—Ztschr. anorg. Chem. 1914, v. 87, p. 253–268.

Kailan, A.: On the chemical action of penetrating radium rays.—Monatsh. Chem. 1914, v. 35, p. 859–887.

Hevesy, G.: Radio elements as indicators in chemistry and physics.—Sci. Am. Suppl. 1914, v. 77, p. 183.

Johnston, George C.: The place of the Röntgen ray in therapeutics.—J. Am. M. Assoc. 1914, v. 63, p. 747–749; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 112–120.

Newcomet, William S.: The use and limitations of radium and Röntgen rays in radiotherapy; illustrated.—J. Am. M. Assoc. 1914, v. 63, p. 743–747; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 121–130.

Hernaman-Johnson, Francis: On the respective advantages and disadvantages of X rays and radium in the treatment of cancer.—Brit. M. J. 1914, v. 1, p. 1010–1012.

Simpson, Frank E.: The use and limitations of radium in skin diseases; illustrated.—J. Am. M. Assoc. 1914, v. 63, p. 737–741.

Freund, E.: Radioactive methods in internal therapy.—Therap. Monatsh. 1914, v. 28, p. 400–414.

von Noorden, C.: Experiences with thorium X in the treatment of internal diseases.—Therap. Monatsh. 1914, v. 28, p. 23–30.

Riddell, James R.: Radium in the treatment of malignant disease.—Brit. M. J. 1914, v. 1, p. 1006–1008.

Lazarus-Barlow, W. S.: The cause and cure of cancer, viewed in the light of recent radio-biological research.—Brit. M. J. 1914, v. 1, p. 1001–1006.

For additional references see Index Med.; Zentralbl. exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

4. BIOLOGICAL PRODUCTS.

Krall, G. M.: The relation of biologic therapy to public health. Active immunization and passive immunization.—Am. J. Public Health, 1914, v. 4, p. 771–785.

Tunmann and Senft: A pharmacognostic review of biochemical and biological products.—Pharm. Post, 1914, v. 47, p. 689ff.

Stewart, F. E.: Manufacture of biological products; a review.—Pharm. Era, 1914, v. 47, p. 501–503.

Digitized by Google

Chase, Walter M.: Practical suggestions for increasing trade in biological products.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1319–1321.

Osseward, Cornelius: Biological products when subjected to great variation of temperature may soon become worthless.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1555.

Freund, Hans: Observations on the biological activities of certain albumin cleavage products.—Pharm. Zentralh. 1914, v. 55, p. 803–808.

Söhngen, N. L.: Influence of various colloids on micro-biological processes.—Chem. Weekblad, 1914, v. 11, p. 42–59.

Ellingwood, Finley: A discussion of the desirability of adding hormones to the eclectic materia medica.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 200–208.

Funk, Casimir: The prophylaxis and therapy of pellagra in the light of the vitamines.—Münch. med. Wchnschr. 1914, v. 61, p. 698–699. See also Hoppe-Seyler's Ztschr. Physiol. Chem. 1914, v. 89, p. 373–380.

Steinert, L.: Vitamine a new factor in the value of food.—Pure Products, 1913, v. 10, p. 386–388.

Stiles, Percy C.: The vitamines. The recognition of essential constituents of the diet hitherto unclassified—deficiency disease.—Sc. Am. Suppl. 1914, v. 77, p. 402; also Am. J. Pharm. 1914, v. 86, p. 237–242.

Hüssy, Paul: The clinical significance of vitamines.—Münch. med. Wchnschr. 1914, v. 61, p. 981–983.

Hill, Leonard: Cooking and vitamines.—Lancet, 1914, v. 186, p. 1002. See also Johnson, T.: Nature, 1914, v. 92, p. 41–42.

Kondo and Gorni: On the efficacious constituents of rice bran.—J. Pharm. Soc. Japan, 1914, September, p. 1013.

Murai, J.: A new method for the extractive of the active constituents of rice bran.—J. Pharm. Soc. Japan, April, 1914, p. 357.

Levene, P. A.: A book review of a volume on nucleic acids, their chemical properties and physiological conduct, by Walter Jones.—Science, 1914, v. 40, p. 640.

Laboschin: A discussion of lecithin and lecithin salts.—Pharm. Ztg. 1914, v. 59, p. 63.

Lavroy, D. M.: The influence of lecithins on the action of medicinal substances.—Compt. rend. Soc. Biol. 1914, v. 76, p. 92.

Baragiola, W. I.: On the occurrence of lecithin in beer and in wine.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 217–219. See also, p. 220–221.

For additional references on biological products see Chem. Abstr.: Chem. Zentralbl.; Zentralbl. Biochem. u. Biophys.; J. Chem. Soc. Lond.

Digitized by Google

Tschirch, A.: Enzymes and their importance in pharmacognosy.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, 154–173; also Pacific Pharm. 1914, v. 8, p. 10–13, and Midl. Drug. 1914, v. 48, p. 55–58.

von Lippmann, Edmund O.: The nomenclature of enzymes, a suggestion.—Chem.-Ztg. 1914, v. 38, p. 81.

Perrot, Em.: The presence of oxidases in vegetable drugs and their influence on the quality of the galenical preparations produced therefrom.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 453–457.

Farr, E. H.: A review of recent progress in enzymes.—Pharm. J. 1914, v. 92, p. 119; also Year-Book of Pharmacy, 1914, p. 322–325.

Long and Muhleman: The mutual action of certain digestive ferments.—Arch. Int. Med. 1914, v. 13, p. 314–348, and Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 8–53. See also Long and Barton, p. 92–112.

A book review of a volume by Carl Oppenheimer on the ferments and their action, with a separate article by R. O. Herzog on the physical chemistry of ferments and ferment action.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 287.

Euler and Cramer: Investigation on the chemical composition and formation of the enzymes, a contribution to our knowledge of invertase formation.—Ztschr. physiol. Chem. 1914, v. 88, p. 430–444. See also v. 89, p. 272–278.

Michaelis, L.: A contribution to the theory of electrolytic dissociation of ferments.—Biochem. Ztschr. 1914, v. 60, p. 91–96.

Bourquelot, Bridel, Hérissey and Aubry: Biochemical synthesis by the aid of ferments.—J. Pharm. et Chim. 1914, v. 9 and 10; also Compt. rend. Soc. Biol. 1914, v. 76 and 77, and Compt. rend. Acad. sc. 1914, v. 158 and 159.

Hudson, C. S.: The inversion of sucrose by invertase.—J. Am. Chem. Soc. 1914, v. 36, p. 1566–1571. See also Hudson and Paine, p. 1571–1580.

Nelson and Born: A study of the chemical constitution of invertase.—J. Am. Chem. Soc. 1914, v. 36, p. 393–403.

Falk, K. George: Studies on enzyme action.—J. Am. Chem. Soc. 1914, v. 36, p. 1047–1057. See also Falk and Suguira, p. 2166–2170.

Thatcher and Koch: The quantitative extraction of diastases from plant tissues.—J. Am. Chem. Soc. 1914, v. 36, p. 759–770.

Jacobson and Holmes: Enzymes present in alfalfa.—J. Am. Chem. Soc. 1914, v. 36, p. 2170–2182.

Lyle and Kober: The importance of enzymes and enzyme reactions in medicine and surgery.—J. Ind. & Eng. Chem. 1914, v. 6, p. 855–856.

Digitized by Google

Edie, E. S.: Some experimental work on the action of enzymes.—Brit. M. J. 1914, v. 2, p. 506.

Brown, Horace T.: Some studies on yeast. The relation of cell reproduction to the supply of free oxygen.—Ann. Bot. 1914, v. 28, p. 197–226.

Neuberg and Nord: The fermentative properties of fresh yeast in the presence of antiseptics.—Biochem. Ztschr. 1914, v. 67, p. 12–17.

Iwanoff, Nicolaus: Observations on the synthetic processes of yeast autolysis.—Biochem. Ztschr. 1914, v. 63, p. 359–368.

Salkowski, E.: On the determination of glycogen in yeast.—Ztschr. physiol. Chem. 1914, v. 92, p. 75–88.

Palladin and Lowtschinowskaja: An experimental study on the oxidation and reduction produced by killed yeasts.—Biochem. Ztschr. 1914, v. 65, p. 129–130.

Cochran and Perkins: The effect of high temperature on yeast.—J. Ind. & Eng. Chem. 1914, v. 6, p. 480.

Seidell, J. T.: The medicinal use of yeast.—Pure Products, 1913, v. 10, p. 367–368.

Jandin, J. Cl.: A study of kephir, with illustrations.—Bull. sc. pharmacol. 1914, v. 21, p. 356–363, 400–409.

Adams, H. M.: Commercial papain and its assay.—J. Ind. & Eng. Chem. 1914, v. 6, p. 669–670.

Lilly, J. K.: Most of the papain on the market is adulterated. We have found lots to contain 50 per cent of starch.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Mansfield, William: The papain of commerce. An illustrated description of the commercially available material.—J. Am. Pharm. Assoc. 1914, v. 3, p. 169–174; also Pract. Drug. 1914, v. 32, p. 244–246.

Glickman, L. H.: Twenty-eight lots of papain were examined during the year. Of these, only two tested 1.50 in proteolytic power.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 153.

Heyl, Caryl, and Staley: Standardization of commercial papain.—Am. J. Pharm. 1914, v. 86, p. 542–550. See also Shelley, F. F.: Analyst, 1914, v. 39, p. 170.

For additional comments on ferments see Zentralbl. Biochem. u. Biophys.; Zentralbl. exper. Med.; Zentralbl. Physiol.; Chem. Zentralbl.; Exper. Sta. Rec.; Chem. Abstr.; and J. Chem. Soc. Lond.

ORGANOTHERAPY.

Weiland, W.: The theory and application of organotherapy, including the use of thyroid, parathyroid, suprarenal, pancreas, hypophysis, and other organic therapeutic preparations.—Therap. Monatsh. 1914, v. 28, p. 229–240.

Digitized by Google

Czubalski, Fr.: The toxic properties of organ extracts.—Arch. exper. Path. u. Pharmakol. 1914, v. 75, p. 347–361.

Schenk, Ferdinand: On the toxicity of organ extracts.—Ztschr. Immun. u. exper. Therap. 1914, v. 22, p. 229–234. See also Dold, p. 513–515.

Bürgi and Traczewski: On the action of organ extracts on the heart.—Biochem. Ztschr. 1914, v. 66, p. 417–439.

Berkeley, William N.: The use of pineal gland in the treatment of certain classes of defective children.—Med. Rec. 1914, v. 85, p. 513–515.

Dannreuther, Walter T.: Corpus luteum organotherapy in clinical practice.—J. Am. M. Assoc. 1914, v. 62, p. 359–362.

Benthin, W.: Ovarinum and internal secretion.—Therap. Gegenw. 1914, v. 55, p. 193–200.

Harrower, Henry R.: The Langerhansian hormone, and the hormone treatment of diabetes.—Med. Rec. 1914, v. 85, p. 1112–1116.

Schmitt, Ch.: The physiological activities of opotherapeutic preparations.—Bull. sc. pharmacol. 1914, v. 21, p. 294–300.

Haffner and Nagamachi: Report of experimental studies on the physiological activities of organ extracts.—Biochem. Ztschr. 1914, v. 62, p. 49–57.

Zeig, John: Organotherapy for pharmacists. A popular review of the biologic products used in medicine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1138–1141.

Landmann, Georg: Researches on the behavior of uric acid to organ extracts by means of the Folin method.—Ztschr. physiol. Chem. 1914, v. 92, p. 416–444.

Münzer, Arthur: The limitations of organotherapy.—Berl. klin. Wchnschr. 1914, v. 51, p. 1812–1814.

For additional references on organotherapy see Zentralbl. Biochem. u. Biophys.; Index. Med.; J. Am. M. Assoc.

SERUMS AND VACCINES.

Schröder, H.: History of the evolution and the present-day status of vaccine treatment.—Therap. Monatsh. 1914, v. 28, p. 81–95.

Blumenthal, Georg: A review of literature relating to serum and vaccine therapy, with a comprehensive bibliography.—Hyg. Rundschau, 1914, v. 24, p. 1001–1012, 1034–1040.

Anon.: A list of the establishments licensed for the propagation and sale of viruses, serums, toxins, and analogous products, under the provisions of the law approved July 1, 1902.—Public Health Rep. 1914, v. 29, p. 1809–1811.

Anderson, John F.: Unhealthy tendencies in therapeutics may be due in part to the extensive propaganda for the use of certain biologic preparations carried on by some of the users and manu-

Digitized by Google

facturers.—J. Am. M. Assoc. 1914, v. 63, p. 1; also Tr. Am. M. Assoc., Sec. Pharm. & Therap. 1914, p. 18.

Voegtlin, Carl: The pharmacological action of some serum preservatives, including tricresol, phenol, formaldehyde, and chloroform.—Bull. Hyg. Lab. No. 96, p. 87–119.

Park, Famulener, and Banzhaf: Serum sensitization as related to dosage of antitoxin in man and animals.—J. Infect. Dis. 1914, v. 14, p. 347–350.

Stewart, J. Reverdy: The production and care of antitoxins and vaccines.—J. Am. Pharm. Assoc. 1914, v. 3, p. 858–862.

Stewart, F. E.: The manufacture of biological products; a review.—Pharm. Era, 1914, v. 47, p. 453–454, 501–503.

Glynn, Ernest E.: Improved methods of standardizing bacterial vaccines in hemocytometer chambers; illustrated.—Lancet, 1914, v. 186, p. 1028–1032.

Eisele, George: Biologic preparations; a review.—Proc. Kentucky Pharm. Assoc. 1914, p. 63–69.

Stone, Williard J.: A note on the preparation of bacterial vaccines.—J. Am. M. Assoc. 1914, v. 63, p. 1010–1112.

Waldecker, F. C.: The phylacogens; a review of their origin, composition, and use.—J. Am. Pharm. Assoc. 1914, v. 3, p. 868–872.

Burton, C. H.: A protest against the discrediting of mixed vaccines and phylacogens, with editorial reply.—J. Am. M. Assoc. 1914, v. 62, p. 552.

Woolfolk, R. H.: Commercial possibilities in biological products; a review.—Nat. Drug. Clerk, 1914, v. 2, p. 649–651.

Stewart, F. E.: The new science of immunology.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1290–1294.

Rolleston, H. D.: Vaccines from the standpoint of the physician.—Lancet, 1914, v. 186, p. 378–379.

Crofton, W. M.: Some causes of failure of vaccine therapy.—Lancet, 1914, v. 186, p. 957–959.

Hitchens, A. Parker: Theories underlying the use of antitoxins and vaccines.—J. Am. Pharm. Assoc. 1914, v. 3, p. 715–721. See also Proc. Pennsylvania Pharm. Assoc. 1914, p. 177–188.

Sherman, G. H.: The practical side of vaccine therapy.—Am. Med. 1914, v. 20, p. 262–267.

Stewart, F. E.: Besredka's sensitized vaccines.—New York M. J. 1914, v. 99, p. 323–327.

Slee, Arthur M.: The advance of serum therapy; a review.—Am. J. Clin. Med. 1914, v. 21, p. 394–396.

Wood, J. B.: The importance of biological products in the control of infectious diseases. A review.—Proc. Nebraska Pharm. Assoc. 1914, p. 35–49.

Digitized by Google

Humphrey, William H.: Vaccine and serum therapy. A review.—J. Am. Inst. Homœop. 1914, v. 6, p. 1011–1020.

J. D. Riedel, A.-G.: A review of serum preparations and their uses.—Riedel's Berichte, 1914, p. 120–125.

Fleming, Alexander: Recent work on vaccine therapy, a review.—Practitioner, 1914, v. 92, p. 420–426.

Laske, C.: On the utilization of special sera in analytical and diagnostic practice.—Apoth.-Ztg. 1914, v. 29, p. 804, 806, 826, 834.

Ballance, Charles A.: A note on a method by which remedial agents may be mingled with the cerebral cerebrospinal fluid.—Lancet, 1914, v. 186, p. 1525.

Schilling and Goretti: On the activity of solutions of drugs in serum.—Ztschr. Immun. u. exper. Therap. 1914, v. 23, p. 257–266.

For additional references see Index Med.; J. Am. M. Assoc.; Zentralbl. Exper. Med.; Chem. Abstr. and Chem. Zentralbl.

BIOLOGICAL METHODS AND TESTS.

Diner, J.: Serum diagnosis. A brief history and its present status.—New York M. J. 1914, v. 99, p. 478–482.

Wohl, Michael G.: The present status of Abderhalden's reaction, with a brief description of the technic and a review of the recent literature.—New York M. J. 1914, v. 99, p. 1065–1070.

Brahm, C.: The Abderhalden prophylactic ferments.—Ztschr. ang. Chem. 1914, v. 27, p. 464–466.

Abderhalden, Emil: The significance and origin of the protective ferments.—Deutsch. med. Wchnschr. 1914, v. 40, p. 268–270. See also Hirsch, Paul, p. 270–271; Allmann, p. 271–274.

Sutter, Charles Clyde: The development of complement-fixation tests.—Med. Rec. 1914, v. 85, p. 783–786.

Browning and Mackie: Studies on complement action; with special reference to the fractioning of complement by means of ammonium sulphate.—Ztschr. Immun. u. exper .Therap. 1914, v. 21, p. 422–446.

Fränkel, Ernst: On the utilization of the Abderhalden reaction in carcinoma and in tuberculosis.—Berl. klin. Wchnschr. 1914, v. 51, p. 356–358. See also Bronfenbrenner, J.: Proc. Soc. Exp. Biol. 1914, v. 11, p. 92–93, and Reneaux, Ernest: Compt. rend. Soc. Biol. 1914, v. 76, p. 864–866.

Ball, Clarence F.: Abderhalden serodiagnosis of cancer with a tabulation of results obtained in 50 examinations.—J. Am. M. Assoc. 1914, v. 62, p. 599. See also Levin, Isaac: New York M. J. 1914, v. 100, p. 621–623.

Voelkel, Ernst: Contribution on the serodiagnosis of infectious diseases by means of the Abderhalden dialysis test.—Münch. med. Wchnschr. 1914, v. 61, p. 349–350.

Digitized by Google

Bronfenbrenner, J.: Application of the serum skin test to the diagnosis of pregnancy and different pathological conditions.—Proc. Soc. Exper. Biol. 1914, v. 12, p. 48–49.

Rosenbloom, Jacob: Experience with the Abderhalden serum test for pregnancy.—Biochem. Bull. 1914, v. 3, p. 373–374. See also Oliver, James: Lancet, 1914, v. 186, p. 1571, and Howe, Paul E.: Biochem. Bull. 1914, v. 3, p. 269–271.

Obregia and Pitulesco: Abderhalden serum reaction in dementia precox.—Compt. rend. Soc. Biol. 1914, v. 76, p. 47–50.

Abderhalden and Grigorescu: Biological proof of the results of the dialysis test.—Münch. med. Wchnschr. 1914, v. 61, p. 767. See also Schiff, Erwin, p. 768.

Bronstein, Joseph: A contribution to the technic of serodiagnosis. The avoidance of hemolysis.—Münch. med. Wchnschr. 1914, v. 61, p. 74.

Bullock, W. E.: The technic of Abderhalden's serum reaction.—Lancet, 1914, v. 187, p. 225–227. See also p. 345.

Vaughan, Victor C.: Parenteral protein digestion.—J. Am. M. Assoc. 1914, v. 63, p. 365–371; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 77–93.

Roddy, John A.: The Ross jelly film method in the diagnosis of syphilis.—New York M. J. 1914, v. 99, p. 424–426.

Fletcher, William: The Wassermann reaction in malaria.—Lancet, 1914, v. 186, p. 1677–1678.

Stern, Margarethe: Contribution on the theory and practice of the Wassermann reaction.—Ztschr. Immun. u. exper. Therap. 1914, v. 22, p. 117–155. See also Olmstead, Miriam P.: Med. Rec. 1914, v. 85, p. 341–343.

Stone, Williard J.: Comparative Wassermann, cobra and globulin tests in syphilis, with a report on 105 reactions.—Med. Rec. 1914, v. 86, p. 545–547.

Gradwohl, R. B. H.: The Hecht-Weinberg reaction as a control over the Wassermann reaction.—J. Am. Pharm. Assoc. 1914, v. 63, p. 240–242.

Southard, E. E.: Statistical notes on a series of 6,000 Wassermann tests for syphilis performed in the Harvard neuropathological testing laboratory, 1913.—Boston M. & S. J. 1914, v. 170, p. 947–950.

Browning, Carl H.: Methods of increasing the accuracy and delicacy of the Wassermann reaction.—Lancet, 1914, v. 186, p. 714–715. See also Thiele and Embleton, p. 715, 1032–1034, and McIntosh, James, p. 644.

Noguchi, Hideyo: Practical application of the luetin test.—New York M. J. 1914, v. 100, p. 349–350.

Additional contributions on the theory and practical application of the several biological tests will be found in Deutsch. med.

Digitized by Google

Wchnschr.; Münch. med. Wchnschr.; Zentralbl. Biochem. u. Biophys.; Zentralbl. exper. Med.; J. Am. M. Assoc.; Index Med.; Brit. M. J.; and Lancet.

5. DISINFECTANTS.

Laubenheimer, K.: Progress in disinfection.—Therap. Monatsh. 1914, v. 28, p. 95–104. See also correction, p. 163.

Morris, Robert T.: Antiseptics versus germicides.—New York M. J. 1914, v. 99, p. 55–56.

Pransintz, Wilhelm: A guide for instruction in practical disinfection.—Österr. Sanitätswesen, 1914, v. 26, p. 1167–1186.

Slee, Arthur M.: Sterilization and disinfection. Practical directions for the general practitioner.—Am. J. Clin. Med. 1914, v. 21, p. 50–54.

Duyser and Lewis: A new method for determining the value of disinfectants.—Chem. Eng. 1914, v. 19, p. 113–115. See also Hamilton and Ohno: Am. J. Public Health, 1914, v. 4, p. 486–497.

St. John, A. D.: A proposed new standard loop for use in bacteriological tests of disinfectants.—J. Ind. & Eng. Chem. 1914, v. 6, p. 940. See also Mahr, Hermann W.: New York M. J. 1914, v. 99, p. 483–484.

England, Joseph W.: The phenol coefficient method of testing disinfectants.—Drug. Circ. 1914, v. 58, p. 204–206; also Merck's Rep. 1914, v. 23, p. 9–11.

Zeig, John: The sale and use of disinfectants. Comments on the coal tar disinfectants, with a table giving the proper dilution of coal tar disinfectants for various purposes.—Proc. California Pharm. Assoc. 1914, p. 69–75.

Dickinson, W. R.: The people should be taught to discard many of the disinfectants and germicides that are kept in their closets and too often taken by mistake for other medicine.—Pacific Drug Rev. 1914, v. 26, July, p. 17.

Brooks, Benjamin T.: Many of the commonly accepted notions as to chemical sterilization might be revised somewhat. Molds or other low forms of life appear not to mind the presence of some of our commonly accepted antiseptics.—J. Ind. & Eng. Chem. 1914, v. 6, p. 958–959.

Editor, Therapeutics Column: The disinfection of schools; a review.—J. Am. M. Assoc. 1914, v. 63, p. 2227.

Thörm and Geilinger: On room disinfection without apparatus according to Doerr and Raubitschik.—Mitt. Lebensm. Hyg. 1914, v. 5, p. 93.

Löwenstein, Walter: The disinfection of dwellings by means of formaldehyde.—Ztschr. Hyg. 1914, v. 78, p. 363–384.

Digitized by Google

Hamilton, Herbert C.: The high coefficient disinfectants are less likely to be destroyed or inhibited in their action and are therefore more generally applicable.—Merck's Arch. 1914, v. 16, p. 188.

Benians, T. H. C.: The resistance of various bacteria to the disinfecting action of toluol, and the allied bodies benzol and xylol.—Ztschr. Chemotherap. 1914, v. 2, p. 28–49.

Winslow, Josephine Barbat: Various methods of disinfection; a review.—Pacific Drug Rev. 1914, v. 26, March, p. 14.

Kuster, Dr.: A comparative examination of the action of the newer methods for disinfecting the hands.—Arb. k. Gsndhtsamte, 1914, v. 48, p. 412–424.

Hamilton, Herbert C.: The disinfectant most generally applicable for clinical, surgical, and sanitary purposes.—Therap. Geg. 1914, v. 38, p. 311–315.

Walker, J. T. Ainslie: Intestinal disinfection. The use of trimethylmethoxyphenol, in the form of a gelatin emulsion.—Am. Med. 1914, v. 20, p. 594–597.

For additional references on disinfection and disinfectants, see Zentralbl. Biochem. Biophys; Hyg. Rundschau.; Zentralbl. exper. Med.; Index Med.; J. Am. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

4. ANALYTICAL DATA.

de Jong, D. J.: The rational quantitative analysis of inorganic constituents of various plant organs and their products.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 654–655.

Franck, H.: The simplification of the examination of drugs and medicines, with a table showing the requirements made in connection with a number of chemical substances and the object of the requirements.—Pharm. Zentralh. 1914, v. 55, p. 365–373.

Hill, C. A.: The production of chemicals and synthetic drugs in Great Britain.—Pharm. J. 1914, v. 93, p. 800–801. See also Williams, Joseph H., p. 293–294.

Anon.: The chemical monographs of the Ph. Brit. V.—Chem. & Drug. 1914, v. 85, p. 636, 667, 699, 727, 758, 783, 819. See also Am. Druggist, 1914, v. 62, p. 432.

Anon.: A table showing the Ph. Brit. V limitations for arsenic and for lead.—Chem. & Drug. 1914, v. 85, p. 492.

Reinders, W.: The chemical action of light; a review.—Chem. Weekblad, 1914, v. 11, p. 282–301.

Rosemund, Karl W.: Colloid chemistry and its applicability to medicine and pharmacy.—Arb. pharm. Inst. Uunv. Berl. 1914, p. 187–200. See also Bradbury, Robert H.: Am. J. Pharm. 1914, v. 86, p. 71–81.

Digitized by Google

Haas, B.: The separation of the several alums into their constituents.—Chem.-Ztg. 1914, v. 38, p. 994.

Gordon, M. A.: Adsorption by filter paper.—J. Phys. Chem. 1914, v. 18, p. 337–354.

Gowing-Scopes, L.: The symbolical representation of analytical operations.—Chem. News, 1914, v. 110, p. 247–250.

Gutbier, A.: A review of the progress in the field of analytical chemistry of the metalloids during 1913.—Chem.-Ztg. 1914, v. 38, p. 291–293.

Schoorl and Zwikker: A review of the development of analytical chemistry in the last 50 years.—Pharm. Weekblad, 1914, v. 51, p. 360–365.

E'we and Vanderkleed: Laboratory notes. A number of observations of miscellaneous character.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1681–1686.

Long, J. H.: A book review of volume eight of Allen's Commercial Organic Analysis, edited by W. A. Davis and Samuel S. Sadtler.—J. Ind. & Eng. Chem. 1914, v. 6, p. 524–525.

Menzies, Alan W. C.: In a book review calls attention to a volume on Quantitative Analysis by Edward G. Mahin.—J. Am. Chem. Soc. 1914, v. 36, p. 2238–2239.

1. ADULTERATIONS.

Porterfield, W. P.: The popular idea of adulteration, that it consists of adding cheaper ingredients, often harmful, to foods, drugs, beverages, confectionery, and other commodities, comes very far from comprising the whole meaning of the word.—Proc. North Dakota Pharm. Assoc. 1914, p. 74; also Northwestern Druggist, 1914, v. 15, September, p. 37.

Ruddiman, E. A.: The examination of medicinal preparations.—Western Druggist, 1914, v. 36, p. 139–140.

Noyes, C. R.: If druggists do not wish to pay the price, they must be satisfied with the frequently mediocre appearance of the U. S. P. articles.—Proc. Minnesota Pharm. Assoc. 1914, p. 188; also J. Am. Pharm. Assoc. 1914, v. 3, p. 605.

Weinstein, Joseph: An outline history of adulteration.—Proc. New York Pharm. Assoc. 1914, p. 112.

Hubert, G.: The repression of illegal practices.—Bull. Assoc. Gén. Syn. Pharm. France, 1914, v. 6, p. 98–100.

Metz, Herman A.: Substitution and those it affects.—Pacific Drug Rev. 1914, v. 26, April, p. 14.

Murray, B. L.: Report of the N. W. D. A. committee on prevention of adulteration.—Proc. N. W. D. A. 1914, p. 250–264.

Digitized by Google

Barnard, H. E.: Report on the activities of the chemical department of the Indiana State Laboratory of Hygiene.—Rep. Indiana Bd. Health, 1914, p. 393–469.

Whitney, M. N.: Report of the committee on drug adulteration.—Proc. Missouri Pharm. Assoc. 1914, p. 103–105.

Neal, P. C.: Report of the committee on adulteration, with table showing the quality of the crude drugs examined during the year.—Proc. Maryland Pharm. Assoc. 1914, p. 94–95.

Richter, Ernst: Report on a number of drugs and chemicals not of official quality.—Apoth.-Ztg. 1914, v. 29, p. 211.

Roth, Richard H.: For preserving the general line of chemicals amber or light-blue bottles are to be preferred as a protection from light.—Pacific Drug. Rev. 1914, v. 26, February, p. 12; also Bull. Pharm. 1914, v. 28, p. 480.

Kebler, L. F.: A table showing the result of analyses of compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1064–1073.

Editorial: Discussion on the desirability of a central station for the examination of medicines.—Pharm. Ztg. 1914, v. 59, p. 497–498.

Jensen, H. R.: Table showing chemical impurities and the amounts of arsenic and of lead per million found in a number of official chemicals.—Evans' An. Notes, 1914, p. 91.

Street, John Phillips: Tables showing the average purity of simple foods and of compound foods and a list showing the forms of food adulteration observed in Connecticut during the years 1896–1914.—Rep. Connecticut Agric. Exper. Sta. 1914, p. 348–354.

2. REAGENTS.

U. S. P. IX: A number of reagents are described.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1581–1583, and Abstr. Prop. Changes, Part 6, 1914, p. 19–21.

A book review calls attention to a volume on Chemical Reagents, Their Purity and Tests, by Henry Schenck. An authorized translation from the German, by E. Merck.—Am. J. Pharm. 1914, v. 86, p. 478–479; also Midl. Drug. 1914, v. 48, p. 345.

Berl, E.: The unification of standards for volumetric solutions, their production, use, and purity.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 649–654.

Lenher, Victor: Guaranteed chemicals and the misleading claims made by dealers and manufacturers.—J. Ind. & Eng. Chem. 1914, v. 6, p. 603.

Wolff, Frank A.: The Bureau of Standards proposes to make a study of the delicacy and suitability of the tests used to detect or determine the impurities present in reagents of various kinds.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1432.

Digitized by Google

E'we and Vanderkleed: Criticism of the U. S. P. directions for making decinormal iodine solution. The suggestion is made to cut down the amount of water to about 40 cc.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1681.

Mayer, Joseph L.: Standardization of volumetric acid and alkali solutions.—J. Am. Pharm. Assoc. 1914, v. 3, p. 708–710.

Pfeifer, Otto: Picric acid as a standard for volumetric solutions.—Ztschr. ang. Chem. 1914, v. 27, p. 383. See also Sander, A., p. 192–194.

Frericks and Mannheim: Composition and uses of Nessler's reagent.—Apoth.-Ztg. 1914, v. 29, p. 972–974.

Vanino and Hartwagner: Bettendorf's reagent and its modifications.—Arch. Pharm. 1914, v. 252, p. 381–399.

Bohrisch, P.: Observations on 0.1 sodium thiosulphate solutions.—Pharm. Ztg. 1914, v. 59, p. 360–362.

U. S. P. IX: To include requirements for purified sawdust to be used in the assay methods of the Pharmacopœia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 997, and Abstr. Prop. Changes, Part 4, 1914, p. 14.

Gordin and Kaplan: Note on comparative adsorption of different substances by Lloyd's reagent, animal charcoal, and aluminum hydroxide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 627–630; also Merck's Rep. 1914, v. 23, p. 189–190, and Southern Pharm. J. 1914, v. 6, p. 533–534.

Lloyd, John Uri: History, origin, qualities, and efficiency of Lloyd's reagent; colloidal hydrous aluminum silicate.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 377–379.

Rehfeld, Gustav: Some facts and demonstrations on Lloyd's reagent and alcresta alkaloids.—J. Am. Pharm. Assoc. 1914, v. 3, p. 710–713.

8. INDICATORS.

van Melckebeke, Raymond: The choice of indicators in titration, with a table showing the properties, solubility, and uses of the several indicators.—Pharm. Weekblad, 1914, v. 51, p. 1579–1586.

Brubaker, H. W.: Some natural indicators, with a table giving the names of flowers and a list of some of the changes noted.—J. Am. Chem. Soc. 1914, v. 36, p. 1925–1928. See also p. 2385, and Chem. News, 1914, v. 110, p. 181–182.

Fernau, Albert: For ordinary pharmacopœial work, the use of methyl orange as an indicator is preferable to the use of litmus.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 276.

Jensen, H. R.: Table showing volumetric analysis equivalents in connection with the use of various indicators.—Evans's An. Notes, 1914, p. 82–83.

Digitized by Google

Hecht: On the utilization of methyl orange as an indicator in the titration of free sulphuric acid in solutions of copper sulphate.—Pharm. Zentralh. 1914, v. 55, p. 808.

Dott, D. B.: Tincture of cochineal is an excellent indicator; the best for titration of alkaloids.—Chem. & Drug. 1914, v. 84, p. 507.

Schick and Hatos: Methyl red as an indicator in the determination of nicotine by the method proposed by Julius Toth.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 269–270.

Barthe: A new vegetable indicator obtained from a potato derived from Uruguay, the tuber of *Solanum commersoni*, which is now being cultivated in moist soils in France.—Répert. pharm. 1914, v. 26, p. 5.

Chapin, Robert M.: A practical method for the preparation of dry starch, soluble in cold water, for use as an indicator.—J. Ind. & Eng. Chem. 1914, v. 6, p. 649–650.

Brandt, L.: On the use of diphenylcarbohydrazid as an indicator in the titration of iron by the bichromate method.—Ztschr. Anal. Chem. 1914, v. 53, p. 1–20.

Hevesy, G.: Radio elements as indicators in chemistry and physics.—Sci. Am. Suppl. 1914, v. 77, p. 183.

Hantzsch, A.: The colloid chemistry of the indicators.—Kolloid-Ztschr. 1914, v. 15, p. 79–83.

Parry, Ernest J.: The detection of turmeric. A review of the several methods that have been used and an indorsement of Bell's test, using diphenylamine.—Chem. & Drug. 1914, v. 84, p. 108–109. See also Merck's Rep. 1914, v. 23, p. 59.

Rippetoe, J. R.: Two samples of curcuma were found to contain 9.91 and 9.12 per cent of alcohol extract and 6.99 and 6.43 per cent of ash, respectively.—Am. J. Pharm. 1914, v. 86, p. 438.

Mann, E. W.: Ash yield for five samples of powdered tumeric varied from 5.27 to 6.44 per cent, with an average of 5.85.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 26.

4. PHYSICAL CONSTANTS.

Williams, Ed. E.: Physical constants of the U. S. P. and N. F. preparations should be more explicitly given.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

SPECIFIC GRAVITY.

Rakshit and Sinha: A table of specific gravities of spirits corresponding to indications of glass hydrometers for use with Bedford's corrected Sikes' tables.—J. Soc. Chem. Ind. 1914, v. 33, p. 288–289. See also p. 619.

Irk, Karl: On the changes of specific gravity of volatile oils at higher temperatures, with tables showing specific gravity noted by various observers.—Pharm. Zentralh. 1914, v. 55, p. 831–837.

Digitized by Google

Remington, J. P.: Volatile oils may vary to such an extent that specific gravity as a test is practically worthless.—Proc. N. A. M. M. P. 1914, p. 33.

Wolff, Frank A.: The testing and standardization of hydrometers.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1429.

Bailey, H. S.: A convenient form of weighing burette.—J. Ind. & Eng. Chem. 1914, v. 6, p. 941.

Anon.: An illustrated description of a homemade hydrometer.—Spatula, 1914, v. 20, p. 362.

SOLUBILITIES.

Anon.: In the new Ph. Brit. V, solubility is expressed by stating the number of milliliters of the solvent in which 1 gram of a solid or 1 milliliter of a liquid will remain in solution at a temperature of 15.5°.—Chem. & Drug. 1914, v. 85, p. 484.

Anon.: Percentage solutions and a table presenting a practical solution chart on the basis of 1 fluid ounce of water.—N. A. R. D. Notes, 1914, v. 18, p. 477–478. See also Am. Druggist, 1914, v. 62, p. 255.

Jensen, H. R.: Table showing solubilities of pharmaceutical chemicals.—Evans' An. Notes, 1914, p. 92–94.

Smith, George McP.: The ideal diffusion coefficient and a fundamental law concerning the diffusion of dissolved substances in liquids.—J. Am. Chem. Soc. 1914, v. 36, p. 847–864.

Herz, W.: The inner friction of salt solutions.—Ztschr. Anorg. Chem. 1914, v. 89, p. 393–396.

Walker, W. J.: On the relationship between the viscosity, density, and temperature of salt solutions.—Phil. Mag. 1914, v. 27, p. 288–297.

Frazer and Lovelace: Studies of the vapor pressure of solutions.—J. Am. Chem. Soc. 1914, v. 36, p. 2439–2449.

Tower and Germann: Vapor pressures of certain alcoholic solutions.—J. Am. Chem. Soc. 1914, v. 36, p. 2449–2456.

v. Georgievics, G.: Adsorption in solutions. Further report of studies on adsorption.—Kolloid-Ztschr. 1914, v. 14, p. 69–74.

Walter, Dora Schmidt: On adsorption and the influence of the solvent on adsorption.—Kolloid-Ztschr. 1914, v. 14, p. 242–252.

Findlay and Howell: The influence of colloids and fine suspensions on the solubility of gases in water.—J. Chem. Soc. Lond. 1914, v. 105, p. 291–298.

Kraus, Charles A.: Solutions of metals in nonmetallic solvents.—J. Am. Chem. Soc. 1914, v. 36, p. 864–877.

Foote and Saxton: On the heat of formation of solid solutions.—J. Am. Chem. Soc. 1914, v. 36, p. 1704–1708.

Tschugaeff and Chlopin: A new method for the determination of solubility at higher temperatures.—Ztschr. Anorg. Chem. 1914, v. 86, p. 154–162.

Digitized by Google

Brönsted, J. N.: On ideal concentrated solutions.—Ztschr. Elektrochem. 1914, v. 20, p. 151–153. See also reply by Nernst, W., p. 153–156; further comment by Brönsted, p. 278–279, and by Eucken, p. 279.

Johnston, John: A book review calls attention to a volume by Svante Arrhenius, on "Theories of Solutions."—J. Am. Chem. Soc. 1914, v. 36, p. 612.

MELTING-POINT DETERMINATIONS.

Havenhill, L. D.: The use of the term "melting point," which is generally understood to mean a definite temperature, is inappropriate when used to designate a range of melting points for a given substance which may extend over several degrees of temperature.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1301.

Fernau, Albert: The Ph. Austr. VIII method for determining the melting point is deficient and could be improved upon.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 275.

Stollé, R.: The determination of melting point according to the German Pharmacopœia.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 280–282. See also Lefeldt, M.: Pharm. Ztg. 1914, v. 59, p. 42.

E'we and Vanderkleed: Note on charging melting point tubes.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1684.

Köhler, Georg: Illustrated description of a carrier for melting point tubes.—Ztschr. ang. Chem. 1914, v. 27, p. 528.

Jensen, H. R.: Table showing consecutive melting points of a large number of official chemicals.—Evans's An. Notes, 1914, p. 80.

A book review of a table by Kempf of the more important organic combinations arranged according to their melting points.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 321.

Paul, Ludwig: New melting points of colophony and their determination.—Chem. Rev. Fett u. Harz Ind. 1914, v. 21, p. 102–105.

Kanolt, C. W.: Melting points of some refractory oxides.—Bull. Bur. Standards, 1914, v. 10, p. 295–313.

Harting and van Dongen: The congealing point of fats and oils.—Pharm. Weekblad, 1914, v. 51, p. 1415–1418; also Apoth.-Ztg. 1914, v. 29, p. 950.

Editorial: The liquefying point of an oil is one that can be determined with accuracy. A congealing point is one that can only be determined with difficulty and may vary under certain conditions.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 398.

Dekhuijzen, M. C.: An illustrated description of a cryoscope for the determination of the freezing point of various products.—Chem. Weekblad, 1914, v. 11, p. 126.

BOILING-POINT DETERMINATIONS.

Finnemore, H.: Determination of boiling points. The method of determining boiling points in the British Pharmacopœia, 1914, and its relation to the boiling point of ether.—Pharm. J. 1914, v. 93, p. 584.

Digitized by Google

Fernau, Albert: A definite, clearly described method for determining the boiling point for official products should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 275.

Richards and Barry: A form of still for the exact measurement of boiling point during fractional distillation.—J. Am. Chem. Soc. 1914, v. 36, p. 1787–1791.

Sudgen, S.: On boiling points in homologous series.—Chem. News, 1914, v. 110, p. 152–153, 165–168.

Jana and Gupta: The relation between the boiling point and composition of a mixture of ethyliodide and ethyl alcohol.—J. Am. Chem. Soc. 1914, v. 36, p. 115–118.

THERMOMETRY.

Gadd, H. Wippell: The Ph. Brit. V no longer includes reference to the Fahrenheit thermometric scale.—Pharm. J. 1914, v. 93, p. 494. See also Chem. & Drug. 1914, v. 85, p. 484, and Am. Druggist, 1914, v. 62, p. 403.

Richards and Fiske: On the transition temperatures of the hydrates of sodium carbonate as fixed points in thermometry.—J. Am. Chem. Soc. 1914, v. 36, p. 485–490; also Chem. News, 1914, v. 110, p. 76–78.

Richards and Shipley: The freezing point of benzene as a fixed point in thermometry.—J. Am. Chem. Soc. 1914, v. 36, p. 1825–1832; also Chem. News, 1914, v. 110, p. 187–189.

Richards and Shipley: A convenient method for calibrating thermometers by means of floating equilibrium.—J. Am. Chem. Soc. 1914, v. 36, p. 1–10.

Bunzel and Hasselbring: A thermoregulator for electrically regulated constant temperature chambers. An illustrated description of the apparatus used.—J. Am. Chem. Soc. 1914, v. 36, p. 949–951.

Feild, Alex. L.: An electrical contact vapor-pressure thermoregulator.—J. Am. Chem. Soc. 1914, v. 36, p. 72–76.

Dickinson, Hobart C.: Combustion calorimetry and the heats of combustion of cane sugar, benzoic acid, and naphthalene.—J. Washington Acad. 1914, v. 4, p. 434–435.

Dickinson, Harper and Osborne: An illustrated description of the calorimetric methods and apparatus used in the determination of the latent heat of fusion of ice.—Bull. Bur. Standards, 1914, v. 10, p. 238.

Dewey, Frederic P.: The pyrometer in the assay muffle.—J. Ind. & Eng. Chem. 1914, v. 6, p. 405–406.

Anon.: An illustrated description of an automatically acting device for sterilizing clinical thermometers.—Pharm. Zentralh. 1914, v. 55, p. 387.

Digitized by Google

Anon.: An illustrated description of a device for shaking down self-registering thermometers.—Pharm. Weekblad, 1914, v. 51, p. 1367.

Billups, H. B.: Many of the thermometer scales and temperature charts are badly made and misleading, some of them being as much as one-half of a degree Fahrenheit in error.—Brit. M. J. 1914, v. 1, p. 1213.

POLARIZATION AND REFRACTION.

Neuberg, C.: A simple polarizing apparatus for micro and macro determinations in white light.—Biochem. Ztschr. 1914, v. 67, p. 102–103.

Anon.: An illustrated description of a simple polarization apparatus.—Apoth.-Ztg. 1914, v. 29, p. 915. See also Pharm. Ztg. 1914, v. 59, p. 92.

Landau, B.: Optical rotation, a review of recent progress.—Fortschr. Chem. 1914, v. 10, p. 61–74.

Armstrong, Rupe, and others: A general discussion on optical rotatory power.—Tr. Faraday Soc. 1914, v. 10, p. 44–139.

Armstrong, Henry E.: The significance of optical properties, a review.—Chem. World, 1914, v. 3, p. 3–4.

Paris and Potter: An experiment on rotatory polarization in liquids.—Phil. Mag. 1914, v. 27, p. 91–95. See also Livens, G. H., p. 994–1000, and comments by Bruhat, G., p. 302–304, and reply by Livens, p. 756–757.

Cohen, J. B.: Position-isomerism and optical activity.—J. Chem. Soc. Lond. 1914, v. 105, p. 1892–1895.

Rupe, H.: The influence of chemical constitution on the rotatory properties of optically active substances.—Ann. Chem. 1914, v. 402, p. 149–186.

Patterson and Pollock: The influence of solvents on the rotation of optically active compounds.—J. Chem. Soc. Lond. 1914, v. 105, p. 2322–2331.

Jones, Harry C.: Absorption spectra and the solvate theory of solutions.—Ztschr. Elektrochem. 1914, v. 20, p. 552–554.

Wright, Robert: The relation between the absorption spectra of acids and their salts.—J. Chem. Soc. Lond. 1914, v. 105, p. 669–679. See also Dobbie and Fox, p. 1639–1642.

Lowry, T. M.: The rotatory dispersive power of organic compounds.—J. Chem. Soc. Lond. 1914, v. 105, p. 81–94. See also Lowry, Pickard, and Kenyon, p. 94–102.

Pickard and Kenyon: Investigations on the dependence of rotatory power on chemical constitution.—J. Chem. Soc. Lond. 1914, v. 105, p. 830–898, 1115–1131, 2262–2280, 2644–2676, 2677–2685.

Digitized by Google

Wesson, L. G.: Optical rotatory power and chemical constitution.—J. Am. Chem. Soc. 1914, v. 36, p. 2522–2532.

Bates and Phelps: Practically all increase in polarization, regardless of atmospheric conditions, may be prevented by covering the funnel with a watch glass.—Comm. Dept. Bur. Stand. Sc. Papers No. 211.

Remington, J. P.: Genuine oils have been found which are sometimes levogyrate and sometimes dextrogyrate.—Proc. N. A. M. M. P. 1914, p. 33.

Von Traubenberg, J. K.: Contribution on the optical activity of mineral oil.—Chem.-Ztg. 1914, v. 38, p. 950. See also Marcusson, J., p. 1243, and Engler and Steinkopf: Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 3358–3362.

Arnold, Wilh.: Refractometer data and their relation to chemical constants.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 311–318.

Wolfrum and Piwnow: The use of sodium light in refractometry.—Ztschr. Nahr. u. Genussm. 1914, v. 28, p. 30–32.

Szalágyi, K.: The refraction and dispersion determinations on fats and oils, with a table showing the results obtained.—Biochem. Ztschr. 1914, v. 66, p. 149–153.

Wright, Fred. E.: Measurements of refractive indices on the principal optical sections of birefracting minerals in convergent polarized light.—J. Washington Acad. 1914, v. 4, p. 534–542.

Mathews, Irene Maud: Refractive index and density.—J. Frankl. Inst. 1914, v. 177, p. 672–686.

Merwin, H. E.: Measurement of the extraordinary refractive index of a uniaxial crystal by observations in convergent light on a plate normal to the optic axis.—J. Washington Acad. 1914, v. 4, p. 530–534.

Wright, Eugene: The measurement of the refractive index of a drop of liquid.—J. Washington Acad. 1914, v. 4, p. 269–279.

Wratschko, Franz: Observations on the refractodensimetry of tinctures. An experimental study on the possible uses of the refractometer in the valuation of tinctures.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 285, 297, 315, 332, 343. See also Mossler, Gustave, p. 355–356, and Wratschko, F.: Südd. Apoth.-Ztg. 1914, v. 54, p. 303.

5. APPARATUS.

Hostmann, Jeannot: Necessary apparatus in a retail pharmacy.—J. Am. Pharm. Assoc. 1914, v. 3, p. 697–699.

Floyd, Henry B.: The laboratory equipment of the pharmacist.—J. Am. Pharm. Assoc. 1914, v. 3, p. 569–571.

Kroeber, Ludwig: The requirements to be made of a satisfactory glass for medicinal purposes.—Apoth.-Ztg. 1914, v. 29, p. 974–978. See also Barladean, A. G.: Schweiz. Apoth.-Ztg. 1914, v. 52, p.

Digitized by Google

469–472, 485–487, and Lenz, W.: Arb. pharm. Inst. Berl. 1914, p. 238–246.

Sullivan and Taylor: Some rapid methods for glass analysis; illustrated.—J. Ind. & Eng. Chem. 1914, v. 6, p. 897–899.

Hardy, J. I.: An illustrated description of an efficient method for cutting glass.—J. Ind. & Eng. Chem. 1914, v. 6, p. 238.

Hamor, W. A.: The present status of the glass bottle industry in the United States.—J. Ind. & Eng. Chem. 1914, v. 6, p. 864–865.

Pinkus, S. N.: An illustrated description of a new extraction apparatus; a modified Soxhlet.—Biochem. Ztschr. 1914, v. 60, p. 311–312. See also Thar, H., v. 58, p. 503–505, Beythien, A.: Chem.-Ztg. 1914, v. 38, p. 832–834, and Freund, Michael, p. 802.

Bailey, Lorin H.: A simple extraction apparatus in use in the Bureau of Chemistry, Department of Agriculture, Washington, with illustrations.—J. Ind. & Eng. Chem. 1914, v. 6, p. 497–499. See also Grosh, Daniel M.: Drug. Circ. 1914, v. 58, p. 391.

Michel, Franz: A new reflux and distilling condenser; illustrated.—Oesterr. Chem.-Ztg. 1914, v. 17, p. 87.

Haiduschka and Rheinberger: An illustrated description of an apparatus for fractional vacuum distillation.—J. Prakt. Chem. 1914, v. 90, p. 354–356.

Wempe, Georg: An illustrated description of a new ammonia distillation flask.—Ztschr. ang. Chem. 1914, v. 27, p. 624.

E'we and Vanderkleed: An illustrated description of an improved form of steam bath.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1686.

Magnin and Bolognini: The use of the centrifuge in the chemical laboratory and a number of uses to which the same may be put.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 902–907.

Glaud and Kempf: An illustrated description of a stirring device for general laboratory use.—Chem.-Ztg. 1914, v. 38, p. 1031–1032.

Panopulos, Georg: An illustrated description of an apparatus for regulating the flow of reagents.—Chem.-Ztg. 1914, v. 38, p. 922.

Braun, Max: An illustrated description of a new gas generator.—Chem.-Ztg. 1914, v. 38, p. 320.

Lau: An illustrated description of a modified Kipp apparatus.—Chem.-Ztg. 1914, v. 38, p. 147.

Lockemann, Georg: An illustrated description of a device for emptying the Kipp apparatus.—Chem.-Ztg. 1914, v. 38, p. 222.

Kleine, A.: An illustrated description of a new form of gasometer.—Chem.-Ztg. 1914, v. 38, p. 1286. See also Voigt, K., p. 1185–1186.

Manguin, E.: An absorption apparatus for use in the analysis of gases; illustrated.—Ann. chim. analyt. 1914, v. 19, p. 219–220.

Suchier, A.: Apparatus for the determination of carbon dioxide, illustrated.—Ztschr. ang. Chem. 1914, v. 27, p. 527–528.

Digitized by Google

Friedrichs, Fritz: A new weighing bottle: illustrated.—Ztschr. Anal. Chem. 1914, v. 53, p. 177–178.

Bailey, H. S.: A convenient form of weighing burette.—J. Ind. & Eng. Chem. 1914, v. 6, p. 941.

Bradley, Theodore J.: A simple form of nitrometer for the assay of spirit of nitrous ether. An illustrated description of the apparatus used.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1442.

Anon.: Illustrated descriptions of chemical and pharmaceutical apparatus.—Pharm. Zentralh. 1914, v. 55, p. 8–10, 103–105, 157–159, 183–184, 215, 230, 297, 353–354, 445–446, 505–606, 634–637, 838–839; also Vrtljschr. prakt. Pharm. 1914, v. 11, p. 82–106, 185–202, 275–291, 357–363.

Wolff, Frank A.: The work of the Bureau of Standards in the standardization of chemical volumetric glassware.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1426–1433.

For additional references on apparatus see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

6. FILTERS.

Bain and Wigle: Studies on filtration with vacuum filters in connection with factory operation.—J. Ind. & Eng. Chem. 1914, v. 6, p. 672–675.

Sweetland, E. J.: An illustrated description of filter presses, with some observations on their use.—J. Ind. & Eng. Chem. 1914, v. 6, p. 142–146, and Tr. Am. Inst. Chem. Eng. 1914, v. 6, p. 170–182. See also Burger, Alfred, p. 183–189.

Anon.: An illustrated description of a funnel that may be taken to pieces.—Pharm. Zentralh. 1914, v. 55, p. 434. See also Apoth.-Ztg. 1914, v. 29, p. 250–251.

Trutzer, E.: A provision for filtering precipitates that are to be quantitatively utilized.—Chem.-Ztg. 1914, v. 38, p. 55.

Wolter, Ludwig: The determination of the content of smooth filters.—Chem.-Ztg. 1914, v. 38, p. 1243.

Peters, R.: A new filtration and extraction tube for the filtration of solutions in volatile solvents.—Apoth.-Ztg. 1914, v. 29, p. 22–23.

Frost, W. A.: A convenient strainer and bottle filler; illustrated.—Proc. Minnesota Pharm. Assoc. 1914, p. 145–148.

Gordon, M. A.: Adsorption by filter paper.—J. Phys. Chem. 1914, v. 18, p. 337–354.

Hicks, W. B.: The action between clay filters and certain salt solutions.—J. Ind. & Eng. Chem. 1914, v. 6, p. 829–831.

Tunmann, O.: The German kieselgur is distributed from Hamburg and comes mainly by way of Bremen.—Apoth.-Ztg. 1914, v. 29, p. 91.

Digitized by Google

Scoville, W. L.: Much of the infusorial earth in the market contains carbonate or soluble matters, which renders it objectionable as a clarifying agent, unless washed with a dilute acid.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1288.

Beringer, George M.: A proposed N. F. monograph for Pumex, pumice.—J. Am. Pharm. Assoc. 1914, v. 3, p. 877.

7. COLOR STANDARDS AND COLORS.

Niece, Frederick E.: Colorimetric methods. An illustrated description of a colorimeter, with suggestions regarding the usefulness and applicability of such an apparatus.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1460–1463. See also Merck's Rep. 1914, v. 23, p. 263–264, and Proc. New York Pharm. Assoc. 1914, p. 281–284.

Scholz, A.: An illustrated description of a colorimeter that can be heated.—Chem.-Ztg. 1914, v. 38, p. 497–498.

Dehn, William M.: Colorimetric studies on the nature of chromate solutions.—J. Am. Chem. Soc. 1914, v. 36, p. 829–847.

Nowak, Carl A.: Conversion curve for Lovibund's tintometer and Stammer's colorimeter. J. Ind. & Eng. Chem. 1914, v. 6, p. 323–324.

Mecklenburg and Rosenkränzer: A new method for the colorimetric determination of small quantities of hydrogen sulphide.—Ztschr. Anorg. Chem. 1914, v. 86, p. 143–153.

Shook, C. A.: Quantitative colorimetric analysis. Its theory, laboratory methods, and apparatus.—Sci. Am. Suppl. 1914, v. 77, p. 178–179, 206–209, 238–240.

Little, L. D.: A colorimetric method for the determination of citral in extracts of lemon and in oil of lemon, with an illustrated description of the apparatus used.—Am. Perf. 1914, v. 9, p. 74–75.

Arny and Pickhardt: The problem of color standardization; a further report on possible uses of solutions of cobalt, iron, and copper as color standards.—Drug. Circ. 1914, v. 58, p. 131–134.

Shook, G. A.: Quantitative colorimetric analysis. Its theory, laboratory methods, and apparatus.—Sci. Am. Suppl. 1914, v. 77, p. 178–179, 206–209, 238–240.

Wolff, Frank A.: The Bureau of Standards is actually engaged in investigating reliable color standards and in the development of methods of color analysis.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1432.

Ives and Brady: An illustrated description of an apparatus for the spectroscopic synthesis of color.—J. Frankl. Inst. 1914, v. 178, p. 89–96.

G. M.: Book review of a volume on the relations between the chemical constitution and the color of organic substances, by André Meyer.—J. pharm. et chim. 1914, v. 9, p. 583.

Digitized by Google

Jennings, J. Ellis: A self-recording device for testing the color sense.—J. Am. M. Assoc. 1914, v. 63, p. 1030–1031.

Berger, Fr.: Color and colors in the service of medicine.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 81–84, 95–98, 109–112, 129–132.

8. ANALYTICAL METHODS AND RESULTS.

Brown, Linwood A.: Methods of analysis for certain pharmaceutical preparations.—J. Am. Pharm. Assoc. 1914, v. 3, p. 642–646.

Kebler, L. F.: An outline of methods of analysis for compressed tables.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1076–1099.

E'we and Vanderkleed: Some laboratory notes. A number of observations on applying official and other tests.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 275–278.

Curry, Gordon L.: Every drug store should have an equipment of laboratory apparatus sufficient for any U. S. P. assay except perhaps a polariscope and refractometer.—Proc. Kentucky Pharm. Assoc. 1914, p. 56.

Rosenstein, Ludwig: In a book review calls attention to a volume on "Qualitative Chemical Analysis," by Anton Vorisek, a laboratory textbook treating of the common elements and their compounds.—J. Am. Chem. Soc. 1914, v. 36, p. 2240–2241.

Kindscher, E.: Progress in analytical chemistry.—Fortschr. Chem. 1914, v. 9, p. 65–71.

Bennett, C. W.: A book review of a volume on "Gas Analysis," by L. M. Dennis.—J. Phys. Chem. 1914, v. 18, p. 181–182. See also Gill, A. H.: Science, 1914, v. 39, p. 286–287.

Duyk, N.: A method for the standardization of solutions for alkalimetry.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 901.

Dubovitz, Hugo: The determination of weight by titration.—Chem.-Ztg. 1914, v. 38, p. 222.

Barlow and Pope.—The chemical significance of crystalline form.—J. Am. Chem. Soc. 1914, v. 36, p. 1675–1686. See also Richards, Theodore W., p. 1686–1695.

Bancroft and Weisen: Flame reactions. The dissociation of luminescent gases and the luminosity of phosphorus gases.—J. Phys. Chem. 1914, v. 18, p. 211–263, 281–336. See also p. 762–781.

Ziegel, Henry: An illustrated description of a panel for electroanalysis, with suggestions for a number of kinks which may be of interest to chemists.—J. Am. Chem. Soc. 1914, v. 36, p. 1450–1452.

Schock, E. P.: A book review of a volume on "Quantitative Analysis by Electrolysis," by Classen and Cloerer, translated from the German by William T. Hall.—J. Am. Chem. Soc. 1914, v. 36, p. 2239–2240. See also Am. J. Pharm. 1914, v. 86, p. 477–478, and Chem. & Drug. Australas, 1914, v. 29, p. 113.

Digitized by Google

Ghosh, J. C.: Alternating current electrolysis.—J. Am. Chem. Soc. 1914, v. 36, p. 2333.

Lewis, Ernest A.: A cheap form of rotating cathode and anode for rapid electrolytic analysis; illustrated.—J. Soc. Chem. Ind. 1914, v. 33, p. 445–446. See also Tr. Am. Inst. Chem. Eng. 1914, v. 6, p. 168–169, and J. Ind. & Eng. Chem. 1914, v. 6, p 166–167.

Lewis and Lacey: The potential of the copper electrode and the activity of bivalent ions.—J. Am. Chem. Soc. 1914, v. 36, p. 804–810.

Magnin, Georges: A novel method for the destruction of organic matter by means of bromine applicable in toxicological work.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 864–871.

Piorkowski: Biological reactions in general and their relation to capillary analysis.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 768–769.

For additional references on analytical methods see Zentralbl. Biochem. u. Biophys.; Chem. Zentralbl.; Chem. Abstr.; J. Chem. Soc. Lond.

9. CHEMICAL CONSTANTS.

Wratschko, F.: The physical constants that may be used for characterizing pharmaceutical preparations are: 1, specific gravity; 2, refraction; 3, optical rotation; 4, absorption; 5, surface heat; 6, electrical conductivity; 7, expansion coefficient; 8, specific heat.—Südd. Apoth.-Ztg. 1914, v. 54, p. 303.

Lefeldt, M.: The Ph. Germ. V directions for determining the acid number of fatty oils should be made more definite.—Pharm. Ztg. 1914, v. 59, p. 42.

Besson, A. A.: The determination of fatty acid content of soaps.—Chem.-Ztg. 1914, v. 38, p. 645–647, 686–687.

Havenhill, L. D.: The word "should" in connection with tests is not emphatic enough for use in expressing a requirement, and its use in this sense in the Pharmacopœia ought to be greatly curtailed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1301.

Wightman, Wiesel, and Jones: A preliminary study of the conductivity of certain organic acids in absolute ethyl alcohol at 15°, 23°, and 35°.—J. Am. Chem. Soc. 1914, v. 36, p. 2243–2259.

10. TESTS.

Havenhill, L. D.: It seems highly desirable that the tests in the U. S. P. be discriminated into "identity or description tests" and "purity requirements."—J. Am. Pharm. Assoc. 1914, v. 3, p. 1301.

Linke, H.: Pharmacopœial tests should be simplified rather than complicated, if it is expected that the apothecary is to control all of the articles sold.—Apoth.-Ztg. 1914, v. 29, p. 674.

Digitized by Google

Anon.: The quantitative and qualitative tests of the Ph. Brit. V for chemicals.—Pharm. J. 1914, v. 93, p. 729. See also Chem. & Drug. 1914, v. 85, p. 484.

Anon.: The tests in the Ph. Brit. V are so jumbled that it is not easy to pick out individual reactions.—Chem. & Drug. 1914, v. 85, p. 609.

Mann, E. W.: The monographs of the Ph. Brit. V on the whole show a very great advance both in methods of analysis and standards over those of the old edition.—Ann. Rep. Southall Bros. & Barclay, 1914, v. 42.

Thompson, H. L.: A drug-store test-tube laboratory. A review of the tests that can and should be applied by the retail druggist.—Proc. Nebraska Pharm. Assoc. 1914, p. 82–90.

Berl, E.: The unification of substances designed for the preparation of volumetric solutions, their conservation, their preparation, and their purity.—Bull. sc. pharmacol. 1914, v. 21, p. 85–86.

HALOGENS.

Stüwe, E.: A direct iodometric method for the determination of soluble iodides.—Apoth.-Ztg. 1914, v. 29, p. 382.

Müller and Wegelin: The iodometric determination of iodine iodide.—Ztschr. Anal. Chem. 1914, v. 53, p. 20–28.

Leclére, A.: Causes of error in iodometry.—J. pharm. et chim. 1914, v. 9, p. 341–345.

Eckardt, F.: The determination of organic iodine in preparations, more particularly preparations containing albumen.—Pharm. Zentralh. 1914, v. 55, p. 818–819, and Pharm. Ztg. 1914, v. 59, p. 441. See also Grützner, R.: Chem.-Ztg. 1914, v. 38, p. 769–770.

Meigen and Winogradoff: The action of halogens on oleic acid and the determination of the iodine number of fats.—Ztschr. ang. Chem. 1914, v. 27, p. 241–244. See also Weiser and Donáth: Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 65–73.

Ellms and Hauser: The effect of ferric salts and nitrites on the ortho-tolidine and starch-iodide tests for free chlorine.—J. Ind. & Eng. Chem. 1914, v. 6, p. 553–554.

Winkler, L. W.: On the determination of the chlorine ion in natural waters.—Ztschr. Anal. Chem. 1914, v. 53, p. 359–362.

Rinkes, I. J.—The chemistry of several organic combinations of fluorine.—Chem.-Weekblad, 1914, v. 11, p. 952–956.

Thies, F. H.: The determination of carbon in water, with the simultaneous determination of halogens.—Chem.-Ztg. 1914, v. 38, p. 115–116.

HYDROGEN SULPHIDE.

Woodcock and Blount: Sulphuretted hydrogen from artificial graphite.—Analyst, 1914, v. 39, p. 67–69.

Digitized by Google

Hall, W. A.: Process for the production of sulphuretted hydrogen. U. S. Patent 1,083,247, Dec. 30, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 137.

Mecklenburg and Rosenkränzer: A new method for the colorimetric detection of traces of hydrogen sulphide.—Ztschr. anorg. Chem. 1914, v. 86, p. 143–153.

Frankforter, Geo. B.: New apparatus for the determination of hydrogen sulphide in water; illustrated.—J. Ind. & Eng. Chem. 1914, v. 6. p. 676–677.

Seeligmann, F.: Observations on the precipitation of zinc and manganese by ammonium sulphide.—Ztschr. Anal. Chem. 1914, v. 53, p. 594; also Apoth.-Ztg. 1914, v. 29, 890.

Trapp, Hans: A new method for chemical analysis without the use of hydrogen sulphide.—Pharm. Zentralh. 1914, v. 55, p. 721.

SULPHUR AND SULPHATES.

Fichter and Braun: The electrolytic oxidation of organic sulphur combinations.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 1526–1534.

Riesenfeld and Egidius: The action of ozone on inorganic combinations of sulphur.—Ztschr. anorg. Chem. 1914, v. 85, p. 217–246.

Stevens, Henry P.: The estimation of sulphur in rubber.—Analyst, 1914, v. 39, p. 74–78.

Bodnár, J.: A new simple titrimetric method for the determination of thiosulphate also in the presence of sulphite.—Ztschr. Anal. Chem. 1914, v. 53, p. 37–41. See also Chem.-Ztg. 1914, v. 38, p. 146–147.

Seidell and Meserve: The determination of minute amounts of sulphur dioxide in air.—J. Ind. & Eng. Chem. 1914, v. 6, p. 298–301; also Chem. News, 1914, v. 110, p. 17–19.

Denigès, G.: The characterization of sulphurous gas in the atmosphere by means of the salts of mercury.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 145–148.

Kedesdy, E.: Observations on the titrimetric determination of free sulphurous acid. Chem.-Ztg. 1914, v. 38, p. 601–602. See also Sander, Ing. A., p. 1057–1058.

Turner, W. A.: An improvement of the barium sulphate determination of sulphur in soluble sulphates when sodium salts are present.—Am. J. Sci. 1914, v. 188, p. 41–44.

North, Horace: The volumetric estimation of sulphates. A method is proposed which promises to be widely useful.—Am. J. Pharm. 1914, v. 86, p. 249–256.

PHOSPHORUS AND PHOSPHATES.

Phelps, Earle B.: The detection of white phosphorus in matches.—Bull. Hyg. Lab. No. 96, p. 51–53.

Digitized by Google

Farnham, G.: Report of the committee of industrial chemists and chemical engineers on the determination of phosphoric acid.—J. Ind. & Eng. Chem. 1914, v. 6, p. 513–514.

Heubner, Wolfgang: The determination of inorganic phosphoric acid in the presence of phosphoric acid esters.—Biochem. Ztschr. 1914, v. 64, p. 401–408.

Corfield and Pratt: The determination of iron in the presence of phosphoric acid.—Pharm. J. 1914, v. 92, p. 131–133; also Year-Book of Pharmacy, 1914, p. 393–399.

Rudnick, Derby, and Latshaw: A comparison of neutral ammonium citrate with sodium citrate and N/10 citric acid in the determination of phosphoric acid.—J. Ind. & Eng. Chem. 1914, v. 6, p. 486–487. See also McCandless, J. M., p. 921–922.

NITROGEN AND NITRATES.

Holmes, Arthur D.: A new and improved form of Kjeldahl distillation apparatus, illustrated.—J. Ind. & Eng. Chem. 1914, v. 6, p. 1010–1012. See also Wunder and Lascar: Ann. chim. analyt. 1914, v. 19, p. 329; Ottow, W. M.: Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 856–863; and Bull. sc. pharmacol. 1914, v. 21, p. 80–81.

Carpiaux, Emile: The destruction of large quantities of organic matter by the Kjeldahl process.—Ann. chim. analyt. 1914, v. 19, p. 97–98.

Hottinger, Rob.: Several modifications of the method of Kjeldahl for the determination of nitrogen. An illustrated description of apparatus used.—Biochem. Ztschr. 1914, v. 60, p. 345–351.

Marino and Gonelli: A new modification of the Kjeldahl method.—Atti accad. Lincei, 1914, v. 23, p. 523–534.

Slizewicz, Laurent: Method of determining organic nitrogen.—Ann. chim. analyt. 1914, v. 19, p. 54–56.

Salvaterra, Heinrich: The titrimetric determination of nitro and nitroso bodies by means of titanium trichloride.—Chem.-Ztg. 1914, v. 38, p. 90–91.

Bradley, T. J.: An illustrated description of a modified Schiff nitrometer especially adapted to the assay of spirit of nitrous ether.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1442.

Busvold, N.: A gravimetric method for the determination of nitrites.—Chem.-Ztg. 1914, v. 38, p. 28.

Beckett, E. G.: Determination of nitrogen in guncotton by means of the nitrometer.—J. Soc. Chem. Ind. 1914, v. 33, p. 628–631.

Busvold, N.: The determination of nitrogen in Norwegian saltpeter.—Chem.-Ztg. 1914, v. 38, p. 799–800.

Russo and Sensi: New methods of analysis by reduction of nitrates, chlorates, and peroxides.—Gaz. chim. Ital. 1914, v. 44, p. 9–15.

Digitized by Google

Letts and Rea: An extremely delicate colorimetric method for detecting and estimating nitrates and nitrites.—J. Chem. Soc. Lond. 1914, v. 105, p. 1157–1161.

Gulick, Addison: Simplification of the determination of total nitrogen by colorimetry.—J. Biol. Chem. 1914, v. 18, p. 541–547.

Letts and Rea: On Freesenius's method for determining small quantities of nitrites, and its sensitiveness compared with the *m*-phenylenediamine reaction.—Analyst, 1914, v. 39, p. 350–352.

AMMONIA.

Sircar, Pulin Bihart: Behavior of ammonium phosphomolybdate with ammonium hydroxide.—J. Am. Chem. Soc. 1914, v. 36, p. 2372–2374.

Bernard, E.: Remarks on L. W. Winkler's contribution on the determination of ammonia by the boric-acid method.—Ztschr. ang. Chem. 1914, v. 27, p. 664.

Rose and Coleman: A standard for the determination of ammonia by means of Nessler solution.—Biochem. Bull. 1914, v. 3, p. 407–415.

Slade, R. E.: Studies of ammonium solutions. A correction.—J. Chem. Soc. Lond. 1914, v. 105, p. 1351–1353.

Simpson, Gilbert: Application of the hexamethylenetetramine (formamine) titration method to the Kjeldahl and other processes.—Pharm. J. 1914, v. 92, p. 546.

For additional references on ammonia see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

CARBON AND CARBONATES.

Grey, E. C.: The volumetric estimation of carbon in aliphatic substances in the wet way.—J. Chem. Soc. Lond. 1914, v. 105, p. 2204–2210.

Thies, F. H.: The determination of carbon in water, with a simultaneous determination of halogens.—Chem.-Ztg. 1914, v. 38, p. 115–116.

Hermann, M.: The determination of oxides of carbon in air.—Ann. Pharm. Louvain, 1914, v. 20, p. 49–51.

Graham and Winmill: The estimation of carbon monoxide.—J. Chem. Soc. Lond. 1914, v. 105, p. 1996–2003.

Sinnatt and Cramer: The determination of carbon monoxide in air.—Analyst, 1914, v. 39, p. 163–169.

Seidell, Atherton: Improvements in the iodine pentoxide method for the determination of carbon monoxide in air, with an illustrated description of the apparatus used.—J. Ind. & Eng. Chem. 1914, v. 6, p. 321–323; also Bull. Hyg. Lab. No. 92, p. 20–28.

Moser and Schmid: The determination of carbon monoxide by yellow mercuric oxide.—Ztschr. Anal. Chem. 1914, v. 53, p. 217–233.

Digitized by Google

Petersen, Julius: The detection of carbon dioxide, especially in a mixture of carbonate and sulphate.—Ztschr. anorg. Chem. 1914, v. 88, p. 234–236.

Winkler, L. W.: On the determination of free carbon dioxide in potable and other waters.—Ztschr. anal. Chem. 1914, v. 53, p. 746–755.

Fresenius and Grünhut: An apparatus for the approximate determination of free carbon dioxide in mineral waters, illustrated.—Ztschr. anal. Chem. 1914, v. 53, p. 265–274.

Nishizaki and Aoyagi: The antiseptic properties of carbon dioxide in aerated waters.—J. Pharm. Soc. Japan, 1914, June, p. 613.

ALKALI COMPOUNDS.

Anon: Sources of commercial potash.—Am. Druggist, 1914, v. 62, p. 449.

Merz, A. R.: Report of observations on the composition of giant kelps.—J. Ind. & Eng. Chem. 1914, v. 6, p. 19–20.

Cushman and Coggeshall: Feldspar as a possible source of American potash.—Oil, Paint & Drug Rep. 1914, v. 86, December 14, p. 32A–32B.

Marshall, Fr.: Observations on a new method for the quantitative determination of potassium.—Chem.-Ztg. 1914, v. 38, p. 585–587, 615–616.

de Ruyter de Wildt, J. C.: The determination of potassium in chemical substances.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 685–690.

Prins, H. J.: On the catalytic action of sodium and other alkalies.—Chem. Weekblad, 1914, v. 11, p. 474–487.

Bosshard and Huggenberg: The determination of free alkalies in soaps.—Apoth.-Ztg. 1914, v. 29, p. 102–103.

Morey, George W.: New crystalline silicates of potassium and sodium, their preparation and general properties.—J. Am. Chem. Soc. 1914, v. 36, p. 215–230.

For additional references on the determination of alkalies see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

ALKALI EARTH COMPOUNDS.

Halla, Franz: The separation of calcium from magnesium.—Chem.-Ztg. 1914, v. 38, p. 100.

Froboese, Victor: The rapid determination of magnesium by titration in the presence of calcium.—Ztschr. anorg. Chem. 1914, v. 89, p. 370–376.

Hostetter, J. C.: A method for the determination of magnesium in calcium salts.—J. Ind. & Eng. Chem. 1914, v. 6, p. 392–396; also Chem. News, 1914, v. 110, p. 155–158.

Digitized by Google

Wdowiszewski, Henryk: The determination of magnesia in magnesites.—Chem.-Ztg. 1914, v. 38, p. 949–950.

Blomberg, C.: The properties of several calcium and magnesium salts and their application in the quantitative separation of the two metals.—Chem. Weekblad, 1914, v. 11, p. 1002–1003.

Foulk and Sweeney: The sulphate method for standardizing a magnesium salt solution.—J. Am. Chem. Soc. 1914, v. 36, p. 2360–2372.

Petit, P.: On the reaction between salts of lime and magnesium and water at ebullition.—Monit. Sci. 1914, v. 81, p. 537–541.

Urbani, Milutin: Increase in weight on the burning of magnesium.—Chem.-Ztg. 1914, v. 38, p. 247.

Riesenfeld and Nottebohm: The peroxides of alkali earths.—Ztschr. anorg. Chem. 1914, v. 89, p. 405–412.

Raubenheimer, Otto: Poisoning by barium. The nature and characteristics of the several commercial salts of barium.—D.-A. Apoth.-Ztg. 1914, v. 35, p. 127–128. See also Drug Topics, 1914, v. 29, p. 162.

For additional references on the determination of alkaline earth see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

ANTIMONY AND ARSENIC.

Vanstone, Ernest: The reactivity of antimony haloids with certain aromatic compounds.—J. Chem. Soc. Lond. 1914, v. 105, p. 1491–1503.

Pagniello: The Bettendorf reaction is not applicable to preparations of antimony.—Boll. chim.-farm. 1914, v. 53, p. 689–691.

U. S. P. IX: Test for arsenic to be modified and to include the standard arsenic solution, directions for the preparation of the chemical to be tested, description of the test apparatus, preparation of the standard stain and of testing the chemical; also description of test for antimony.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1579–1581, and Abstr. Prop. Changes, Part 6, 1914, p. 17–19.

Anon.: A table showing the lead and arsenic limits (parts per million) of the Ph. Brit. V.—Pharm. J. 1914, v. 93, p. 455.

Moreau and Vinet: Illustrated description of a method for determining traces of arsenic.—Ann. Chim, analyt. 1914, v. 19, p. 214–216.

Weinland, R.: Observations on reduction by arsenous acid in alkaline solutions.—Apoth.-Ztg. 1914, v. 29, p. 47–48.

Chapin, Robert M.: The reduction of arsenic acid to arsenious acid by thiosulphuric acid.—J. Agric. Research, 1914, v. 1, p. 515–517.

Brandt, L.: On the quantitative separation of arsenic from the metals by means of hypophosphorous acid.—Chem.-Ztg. 1914, v. 38, p. 461, 474.

Digitized by Google

Sieverts and Wippelmann: The rapid electrolytic separation of copper and of arsenic.—Ztschr, anorg. Chem. 1914, v. 87, p. 169–174.

Dieckmann and Hilpert: Observations on the separation of arsenic from tungsten.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2444–2446.

Book review of a volume by H. Wöbling on the methods of determining arsenic, antimony, tin, and their separation from other elements.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 282.

Rind, Oskar: Experiments in the quantitative determination of arsenic by means of the Marsh apparatus.—Oesterr. Chem.-Ztg. 1914, v. 17, p. 208–210.

Segerstedt, A.: Experiments in the quantitative determination of arsenic.—Svensk farm. Tidskr. 1914, v. 18, p. 21–22. See also Ericsson, Antipas, p. 473–478.

Tarbell, R. F.: The determination of arsenic in hydrochloric and sulphuric acids.—J. Ind. & Eng. Chem. 1914, v. 6, p. 400–401. See also Nissenson, H.: Chem.-Ztg. 1914, v. 38, p. 1097.

Koelsch, H.: A rapid method for the determination of arsenic in sulphuric acid and in hydrochloric acid.—Chem.-Ztg. 1914, v. 38, p. 5–6.

Schutz, A. F.: The arsenic content of modern wall papers and the consideration from a hygienic standpoint. Arsenic was found to be present as a contamination of some colors in amounts that were negligible.—Arb. k. Gsndhtsamte, 1914, v. 48, p. 303–320. See also Bloemendaal, W. H.: Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 886–890.

Vinograd, Mariam: Determination of arsenic in organic matter, with illustrated description of the apparatus used.—J. Am. Chem. Soc. 1914, v. 36, p. 1548–1551. See also Barthe, L.: Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 340–348.

Underhill, Frank P.: The distribution of arsenic in the human body.—J. Biol. Chem. 1914, v. 19, p. 513–515.

Simonot, E.: The principal methods for the integral destruction of organic matter in the toxicological determination of arsenic.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 101–115.

Lewin, L.: The detection of arsenic in acute and in chronic poisoning.—Apoth.-Ztg. 1914, v. 29, p. 503–506.

Lippmann: The increase of the resistance from the antibody content of the organism by marrow irritants, more particularly the arsenicals, with a comprehensive literature.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 124–140.

For additional references on arsenic and antimony see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

Digitized by Google

U. S. P. IX: Heavy metals test will be modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1583, and Abstr. Prop. Changes, Part 6, 1914, p. 21.

E'we and Vanderkleed: The presence of iron obscures the U. S. P. time-limit test for heavy metals beyond the iron group.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 276.

Jensen, H. R.: Table showing the usual maximum of lead contamination occurring in the medicinal chemicals.—Evans' An. Notes, 1914, p. 91.

Richardson, B. P.: Electro-analytical studies. The necessary apparatus. The separation and precipitation of bismuth and related cations.—Ztschr. anorg. Chem. 1914, v. 84, p. 277–318.

Alder and Coolbaugh: A volumetric method for the determination of lead.—J. Ind. & Eng. Chem. 1914, v. 6, p. 398–400.

Breteau and Fleury: Method for the determination of small quantities of lead.—J. pharm. et chim. 1914, v. 10, p. 265–273.

Fauconnier, P.: A novel method for the determination of lead in the organism.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 310–314.

Iwanow, W. N.: A new very sensitive reaction for lead.—Chem.-Ztg. 1914, v. 38, p. 450. See also Eegriwe, Edwin: Ztschr. Anal. Chem. 1914, v. 53, p. 420–426.

Milbauer and Pivnicka: Analytical chemical examinations of the higher lead oxides.—Ztschr. Anal. Chem. 1914, v. 53, p. 345–359, 569–581.

McCay, Le Roy W.: The use of hydrofluoric acid in the separation of copper and lead from tin and antimony by means of the electric current.—J. Am. Chem. Soc. 1914, v. 36, p. 2375–2381.

Curtman and Marcus: A new procedure for the separation of the copper and tin groups.—J. Am. Chem. Soc. 1914, v. 36, p. 1093–1103.

Windisch, K.: The determination of copper by means of sodium hypophosphite.—Pharm. Zentralh. 1914, v. 55, p. 817.

Denigès and Simonot: A new method for the colorimetric determination of copper.—Bull. Soc. Pharm. Bordeaux, 1914, v. 54, p. 337–340.

Field, Allan J.: Methods of analysis for copper salts solutions.—Chem. Eng. 1914, v. 20, p. 11–12.

Zuccari, Gino: New method for the volumetric determination of copper.—Boll. chim.-farm. 1914, v. 53, p. 321–322.

Sieverts and Wippelmann: The rapid electrolytic separation of copper and of arsenic.—Ztschr. anorg. Chem. 1914, v. 87, p. 169–174. See also Cloukey, H.: J. Ind. & Eng. Chem. 1914, v. 6, p. 265–266.

Reese and Drost: The lead, copper and zinc content of factitious mineral waters and the determination of these metals.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 427–449.

Digitized by Google

Hüttner, C.: The colorimetric determination of cobalt, nickel, iron, and copper.—Ztschr. anorg. Chem. 1914, v. 86, p. 341–357.

Lander and Geake: Iodometry of arsenic, copper and iron.—Analyst, 1914, v. 39, p. 116–121.

Cooper, W.: The determination of cadmium in zinc.—Chem. News, 1914, v. 110, p. 250–251.

Torrossian, G.: Modifications of the reduction test for tungstic acid.—Am. J. Sci. 1914, v. 188, p. 537.

Gutbier and Weise: The precipitation and determination of tungstic acid. A new use for nitron.—Ztschr. Anal. Chem. 1914, v. 53, p. 426–430.

Dieckmann and Hilpert: Observations on the separation of arsenic from tungsten.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2444–2446.

Jamieson and Wrenshall: On the determination of titanium as phosphate.—Chem. News, 1914, v. 110, p. 54–55. See also Ball and Smith: J. Am. Chem. Soc. 1914, v. 36, p. 1838–1843.

Treadwell, W. D.: The cyanometric determination of zinc.—Chem.-Ztg. 1914, v. 38, p. 1230–1233.

Lindt, V.: A rapid method for the quantitative determination of nickel colorimetrically.—Ztschr. Anal. Chem. 1914, v. 53, p. 165–175.

Gutbier and Huber: Gravimetric determination of tellurium.—Ztschr. Anal. Chem. 1914, v. 53, p. 430–433.

Wunder and Wenger.: On a separation of beryllium and uranium.—Ztschr. Anal. Chem. 1914, v. 53, p. 371–374.

La Wall, Charles H.: A volumetric method for the estimation of mercury in some of its compounds and preparations.—J. Am. Pharm. Assoc. 1914, v. 3, p. 50.

Chapin, Robert M.: The assay of mercuric chloride tablets, a review of available methods.—Am. J. Pharm. 1914, v. 86, p. 1–6.

Salkowski, E.: The detection of mercury in urine and in the various organs of the body.—Biochem. Ztschr. 1914, v. 81, p. 27–40.

Guérin, G.: On the detection of lead in bismuth subnitrate.—J. pharm. et chim. 1914, v. 10, p. 22–23.

E'we and Vanderkleed: Determination of chromium in presence of acacia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1682.

Metzl, Albert: A new volumetric method for the determination of cobalt in the presence of nickel.—Ztschr. Anal. Chem. 1914, v. 53, p. 537–541.

Nissenson, H.: The determination of arsenic, iron, and mercury in sulphuric acid.—Chem.-Ztg. 1914, v. 38, p. 1097.

Ziegel, Henry: Automatic titration. The electrometric titration of bichromate and of ferro iron.—Ztschr. Anal. Chem. 1914, v. 53, p. 755–762.

Digitized by Google

van Pelt, V.: Researches on methods for the determination and separation of aluminum, chromium, zinc, and manganese.—Bull. Soc. Chim. Belg. 1914, v. 28, p. 101–127, 138–143.

Thornton, William M., jr.: The separation of titanium from iron, aluminum, and phosphoric acid with the aid of the ammonium salt of nitrosophenylhydroxylamine ("Cupferron").—Am. J. Sc. 1914, v. 187, p. 407–414. See also p. 173–178; Ztschr. anorg. Chem. 1914, v. 87, 375–383; and Chem. News, 1914, v. 110, p. 153–155.

Pickering, S. U.: The color intensity of iron and copper compounds.—J. Chem. Soc. Lond. 1914, v. 105, p. 464–483.

Russo, C.: A new reduction method for iron salts.—Gaz. chim. Ital. 1914, v. 44, p. 1–8.

Corfield and Pratt: The determination of iron in the presence of phosphoric acid.—Pharm. J. 1914, v. 92, p. 131–133.

Barnebey, O. L.: The permanganate determination of iron in the presence of chlorides.—J. Am. Chem. Soc. 1914, v. 36, p. 1429–1450. See also Brandt, L.: Ztschr. anal. Chem. 1914, v. 53, p. 728–745.

Fendler, G.: Critical comments on the method for the determination of iron proposed by Neumann.—Ztschr. physiol. Chem. 1914, v. 89, p. 279–288.

Allen, H. C.: The electrolytic reduction of iron for permanganate titration.—J. Am. Chem. Soc. 1914, v. 36, p. 949–951.

Borck, Hermann: A convenient method for the separation of iron and aluminum.—Chem.-Ztg. 1914, v. 38, p. 7.

Lührig, H.: The colorimetric determination of minute quantities of manganese in water.—Chem.-Ztg. 1914, v. 38, p. 781–783. See also Schowalter, E.: Pharm. Zentralh. 1914, v. 55, p. 705, and Meerburg, P. A.: Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 1088–1092.

Villiers, A.: Manganese sulphide and the determination of that metal.—Bull. Soc. chim. France, 1914, v. 15, p. 758–865.

Rohland, Paul: On the adsorption property of the hydroxides of silica, aluminum and iron.—Ztschr. anorg. Chem. 1914, v. 89, p. 164–166.

Rathgen, F.: The microchemical detection of aluminum, illustrated.—Ztschr. Anal. Chem. 1914, v. 53, p. 33–37.

Petit, G: The detection of traces of aluminum.—Répert. pharm. 1914, v. 26, p. 101.

For additional references see Chem. Abstr.; J. Chem. Soc. Lond.; and Chem. Zentralbl.

ORGANIC COMPOUNDS.

Emery, W. O.: Studies in synthetic drug analysis; on the estimation of acetanilide and phenacetin in admixture.—J. Ind. & Eng. Chem. 1914, v. 6, p. 665–669.

Digitized by Google

Kendall and Carpenter: The addition compounds of organic substances with sulphuric acid.—J. Am. Chem. Soc. 1914, v. 36, p. 2498–2517.

Kirpal, Alfred: Gravimetric methoxyl determination.—Apoth.-Ztg. 1914, v. 29, p. 345.

van der Haar, A. W.: A method for the determination of benzoyl derivatives.—Arch. Pharm. 1914, v. 252, p. 205–208.

Haüssler, E. P.: The reactions of vanillin.—Ztschr. anal. Chem. 1914, v. 53, p. 363–371.

Fried and Lindemann: An investigation in the coumarin series.—Ann. Chem. 1914, v. 404, p. 53–80.

Arny and Schaefer: The ferric alum estimation of caseine.—J. Ind. & Eng. Chem. 1914, v. 6, p. 748–751.

SUGAR.

Cramer, William: The reduction of cupric salts by sugar.—Proc. Chem. Soc. 1914, v. 30, p. 293.

Nef, J. U.: Dissociation processes in the sugar group.—Ann. Chem. 1914, v. 403, p. 204–383.

Roberts, Alfred E.: A study of the efficiency of various methods for the filtration of sugar solutions.—J. Ind. & Eng. Chem. 1914, v. 6, p. 986–989.

Dohn and Hartman: The picrate colorimetric method for the estimation of carbohydrates.—J. Am. Chem. Soc. 1914, v. 36, p. 403–409.

von Lippmann, Edmund O.: Observations on the inversion of saccharose.—Chem.-Ztg. 1914, v. 38, p. 145–146.

Muttelet, C. F.: The estimation of dextrin and sugar in food products.—Ann. falsif. 1914, v. 7, p. 372–380.

Pinoff and Gude: A simple quantitative and qualitative method for the detection of levulose in the presence of other sugars.—Chem.-Ztg. 1914, v. 38, p. 625–626.

Hudson and Harding: The preparation of raffinose.—J. Am. Chem. Soc. 1914, v. 36, p. 2110–2114.

Smit, Jan: On the methods for the quantitative determination of mannite; experimental observations.—Ztschr. Anal. Chem. 1914, v. 53, p. 470–490.

For additional comments on sugar see Zentralbl. Biochem. u. Biophys.; Chem. Zentralbl.; Chem. Abstr.; J. Chem. Soc. Lond.

11. CLINICAL TESTS.

Gutemann, S.: The determination of calcium in organic animal liquids and organic solid substances.—Biochem. Ztschr. 1914, v. 58, p. 470–471. See also v. d. Heide, v. 65, p. 363–380.

Digitized by Google

Thomas, Karl: Observations on the origin of creatin in the animal organism.—Ztschr. physiol. Chem. 1914, v. 88, p. 465–477.

Wills and Hawk: Studies on water drinking.—J. Am. Chem. Soc. 1914, v. 36, p. 158–165. See also p. 1774–1785.

Wilson and Hawk: Fasting studies.—J. Am. Chem. Soc. 1914, v. 36, p. 137–146. See also Blatherwick and Hawk, p. 147–152.

Greenwald, Isidor: Nitrogen and sulphur metabolism in a cretin.—Arch. Int. Med. 1914, v. 14, p. 374–375.

URINE.

Mayer, Otto: A short contribution on methods for urine examination.—Pharm. Post, 1914, v. 47, p. 511–512.

Horstmann, G.: Outline of methods used in the analysis of urine.—Phys. Drug News, 1914, v. 9, p. 347–350. See also Pract. Drug. 1914, v. 32, p. 282–284, 334–336.

Jolles, Adolf: A further contribution on the methods for the examination of the urine.—Apoth.-Ztg. 1914, v. 29, p. 706–708.

Mayer, Joseph L.: Some additional sources of error in the chemical examination of urine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 687–689.

Thompson, H. L.: A urinalysis outfit for the retail druggist with a list of the chemicals required.—Proc. Nebraska Pharm. Assoc. 1914, p. 90.

Weinstein, Joseph: Urine analysis as a profitable side line for the pharmacist.—Pract. Drug. 1914, v. 32, p. 386; also Proc. New York Pharm. Assoc. 1914, p. 279–281.

Rosenbloom, Jacob: Gum camphor as a preservative for urine.—New York M. J. 1914, v. 99, p. 735–736.

Dehn and Hartman: A comparison of various preservatives of urine, with tables showing the changes brought about in the presence of the respective preservatives.—Merck's Rep. 1914, v. 23, p. 245–247.

Utz: Review of some of the literature relating to the coloring matter in urine.—Pharm. Post, 1914, v. 47, p. 471–472.

Schneider, Albert: Microscopical examination of urinary sediment.—Pacific Pharm. 1914, v. 7, p. 278–279.

Herm, P.: The detection of casts in urine with a description of the several forms.—Pharm. Zentralh. 1914, v. 55, p. 67–69. See also Schweiz. Apoth.-Ztg. 1914, v. 52, p. 409–411.

Sartorium, Theodor: The detection and determination of casts in the urine.—Pharm. Zentralh. 1914, v. 55, p. 1–2.

Tanret, Ch.: On the defecation of urine by means of mercuric nitrate.—J. pharm. et chim. 1914, v. 9, p. 602.

Carlson, C. E.: A new method for the detection of organic substances in urine.—Svensk farm. Tidskr. 1914, v. 18, p. 33–36.

Digitized by Google

Kakinchi, J.: Method for the detection of fat in urine.—Pharm. Zentralh. 1914, v. 55, p. 748.

Ishihara, Hiromu: The detection of lactic acid in urine.—Pharm. Zentralh. 1914, v. 55, p. 747.

Baldoni, Alessandro: A new method for the quantitative determination of salicyluric acid.—Arch. farm. sper. 1914, v. 18, p. 1–8. See also p. 151–177.

Anon.: Detection of methyl alcohol and formaldehyde in urine by means of the morphine reaction.—Drug. Circ. 1914, v. 58, p. 521.

Handovsky, Hans: The determination of allantoin in urine by titration.—Ztschr. physiol. Chem. 1914, v. 90, p. 211–220.

Pilmmer and Skelton: The estimation of allantoin in urine in the presence of glucose.—Biochem. J. 1914, v. 8, p. 641–648.

Neuberg and Czapski: The occurrence in urine of urogol and urogon, substances isomeric with cresol.—Biochem. Ztschr. 1914, v. 67, p. 28–31.

Isnard, E.: The detection of picric acid in urine.—Ann. chim. analyt. 1914, v. 191, p. 100–101; also Répert. pharm. 1914, v. 26, p. 193–194.

Pfau, Herm.: The detection of iodine in urine.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 93–94.

Klotz, A.: The quantitative determination of mercury in urine.—Ztschr. physiol. Chem. 1914, v. 92, p. 286–291. See also Palme, Herman: Svensk farm. Tidskr. 1914, v. 18, p. 605–608; and Salkowski, W.: Biochem. Ztschr. 1914, v. 61, p. 27–40.

Palme, Herman: A method for the electrolytic determination of mercury in urine.—Ztschr. physic. Chem. 1914, v. 89, p. 345–348.

Bloeme, Swart, and Terwen: The colloidal nitrogen of urine and its importance in the diagnosis of carcinoma.—Biochem. Ztschr. 1914, v. 65, p. 345–349.

Editorial: The significance of starch-digesting enzyme in the urine.—J. Am. M. Assoc. 1914, v. 63, p. 2295–2296.

Hull, Mary: Some observations on the excretion of creatinine by women.—J. Am. Chem. Soc. 1914, v. 36, p. 2146–2151. See also Editorial: J. Am. M. Assoc. 1914, v. 63, p. 2296–2297.

Burns and Orr: The influence of excessive water ingestion on the excretion of creatin and creatinine.—Brit. M. J. 1914, v. 2, p. 505–506.

Binet, Defins, and Rathery: Observations on the influence of acetyl acetic acid in urine on the exact determination of creatinine and of creatine by the colorimetric method of Folin.—Compt. rend. Soc. biol. 1914, v. 77, p. 479–482.

Weiss and Ssobolew: A colorimetric method for the determination of histidin.—Biochem. Ztschr. 1914, v. 58, p. 119–129.

Geyelin, H. Rawle: A clinical study of amylase in the urine.—Arch. Int. Med. 1914, v. 13, p. 96–120.

Digitized by Google

Cammidge and Howard: Observations on the composition and derivatives of urinary dextrin.—Lancet, 1914, v. 187, p. 791–793.

Humphry, Laurence: The urinary diastase test and Loewi's reaction in pancreatic lesions.—Brit. M. J. 1914, v. 1, p. 1229–1230.

Thomson, H. Hyslop: The diazo- and Russo reactions in pulmonary tuberculosis.—Practitioner, 1914, v. 92, p. 74–79.

Schäffle, Karl: A comparison between the urochromogen and diazo tests in the prognosis of tuberculosis.—J. Am. M. Assoc. 1914, v. 63, p. 1294–1295.

Greinert, E.: The diazo reaction with atophan urine.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 458–475.

Welwart: A method for increasing the sensitivity of the Ehrlich diazo reaction.—Münch. med. Wchnschr. 1914, v. 61, p. 480.

A book review calls attention to a volume by A. Escaich on the anomalies of urine.—Apoth.-Ztg. 1914, v. 29, p. 699.

Anon.: Short abstracts of a number of articles on the testing of urine.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 345–346. See also Utz: Pharm. Post, 1914, v. 47, p. 447ff.

Spaeth, Eduard: A review of progress and experiences in the examination of urine.—Südd. Apoth.-Ztg. 1914, v. 54, p. 136, 144, 152, 162, 170, 180, 188, 196, 204, 230, 237, 246, 253, 262, 270, 323, 340 348, 380, 388, 396, 404, 412, 420.

For additional comments on clinical tests, urine, see Zentralbl Biochem. u. Biophys.; Chem. Zentralbl.; Chem. Abstr.; J. Chem Soc. Lond.

Acidity.—Freeman, Rowland Godfrey: For diacetic acid, a 1C per cent ferric chloride solution is added to 5 cc. of urine until the mixture clears. A Burgundy red color indicates diacetic acid, the amount varying with the saturation of the color.—J. Am. M. Assoc. 1914, v. 63, p. 1803.

Mayer, Joseph L.: In testing for diacetic acid, the fact must not be overlooked that it is very volatile and that tests must not be made after the sample is a day old.—J. Am. Pharm. Assoc. 1914, v. 3, p. 688.

Editorial: The lessons of a unique case of diabetic acidosis.—J. Am. M. Assoc. 1914, v. 63, p. 2297. See also v. 62, p. 1731.

Acetone.—Cervello and Girgenti: The qualitative and quantitative determination of acetone.—Arch. exper. Path. u. Pharmakol. 1914, v. 76, p. 118–124. See also v. 75, p. 153–167.

Sobel. L.: The quantitative determination of acetone in urine.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 62–63. See also Beuttner, p. 293–294.

Niece, Frederic F.: An improved method for testing urine for acetone.—Drug. Circ. 1914, v. 57, p. 711–712. See also Freeman, Rowland Godfrey: J. Am. M. Assoc. 1914, v. 63, p. 1803.

Digitized by Google

Mayer, Joseph L.: In testing for acetone with glacial acetic acid and overlying with ammonia water, phenolphthalein will produce a coloration very much the same as acetone.—J. Am. Pharm. Assoc. 1914, v. 3, p. 688.

Fleischmann: An outline of a modification of the Legal test for acetone in urine.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 222.

Albumin.—Petit, G. H.: The detection of traces of aluminum. An outline of the method.—J. pharm. et chim. 1914, v. 9, p. 66–69.

Schmiz, Ed.: The simulation of an albumin reaction by hexamethylenetetramine.—Deutsch. med. Wchnschr. 1914, v. 40, p. 128–129; also Pharm. Ztg. 1914, v. 59, p. 187.

Pfau. H.: The detection of albumin in urine by means of Esbachsch's reagent in the presence of hexamethylenetetramine.—Pharm. Ztg. 1914, v. 59, p. 103; also Schweiz. Apoth.-Ztg. 1914, v. 52, p. 162–163.

Strzyzowski, Casimir: The determination of albumin in the urine by centrifugal means.—Ztschr. physiol. Chem. 1914, v. 88, p. 25–37.

Eldred and Pence: Convenient method for the estimation of albumin in urine. A quantitative method that involves the use of monobasic sodium phosphate with a mixture of acetone and glacial acetic acid.—Merck's Rep. 1914, v. 23, p. 61–62; also Lilly Sci. Bull. 1914, Ser. 1, p. 121–126.

Lippich, F.: The precipitation of albumin by means of zinc sulphate.—Ztschr, physiol. Chem. 1914, v. 90, p. 236–249.

Mayer, Joseph L.: Purdy's test for albumin is a very sensitive and trustworthy one, but care must be exercised to keep the tubes very clean.—J. Am. Pharm. Assoc. 1914, v. 3, p. 688.

Jolles, Adolf: A reply to criticisms of the method for determining albumin in urine.—Apoth.-Ztg. 1914, v. 29, p. 706–708; also Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 79–81.

Kahn and Silberman: The quantitative estimation of albumin in urine. A comparison of the reliability of the various methods.—New York M. J. 1914, v. 100, p. 667–669.

Teuscher: A practical reagent for the detection of albumin. The sulpho-salicylic acid test.—Deutsch. med. Wchnschr. 1914, v. 40, p. 441.

Riegler, E.: A colorimetric method for the determination of albumin in urine. The intensity of the violet coloration due to the solution of copper oxide by albumin.—Ztschr. Anal. Chem. 1914, v. 53, p. 242–245. See also Claudius, M.: Münch. med. Wchnschr. 1914, v. 61, p. 1964–1965.

Lespinasse, A.: Practical notes on the detection of albumin and other albuminous substances in urine.—Bull. sc. pharmacol. 1914, v. 21, p. 150–156.

Digitized by Google

Guyot, René: Acid soluble albumin in the urine.—J. pharm. et chim. 1914, v. 9, p. 243–248.

Schumm and Kimmerle: The occurrence of a crystallizable but not coagulable albumin product in the urine in a case of gastric carcinoma, with a table showing the forms of crystals.—Ztschr. physiol. Chem. 1914, v. 92, p. 1–12.

Brandeis, R.: The diverse forms of albumin in urine.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 157–164.

Blanc and Rameau: A table showing the comparative reactions of albuminoid materials in urine.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 85. See also J. pharm. Anvers, 1914, v. 70, p. 123.

Ammonia.—de Jager, L.: On the reliability of the determination of ammonia, amino acids and polypeptides in the urine by means of formaldehyde.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 811–817.

Spindler, O.: Nitrates may be a disturbing factor in the determination of nitrogen in urine by the Kjeldahl method.—Südd. Apoth.-Ztg. 1914, v. 54, p. 546.

Kochmann, M.: A simplification of the micro-Kjeldahl method proposed by Bang and Larsson.—Biochem. Ztschr. 1914, v. 63, p. 479–482.

Gulick, Addison: Simplification of the determination of total nitrogen by colorimetry.—J. Biol. Chem. 1914, v. 18, p. 541–547.

Bile.—Lipp, Hans: A simple method for the detection of biliary coloring matter and of hemoglobin in urine.—Münch. med. Wchnschr. 1914, v. 61, p. 1965.

Rosenbloom, Jacob: On testing urine for bile pigments and for diacetic acid.—New York M. J. 1914, v. 99, p. 229.

Berkowitz, Samuel: Ehrlich's aldehyde reaction for urobilin.—Med. Rec. 1914, v. 86, p. 1087–1089.

Rabinowitsch, Marcus: The urobilin and diazo reactions in typhus fever.—Berl. klin. Wchnschr. 1914, v. 51, p. 1456–1457.

Wilbur and Addis: Urobilin: its clinical significance.—Arch. Int. Med. 1914, v. 13, p. 235–286.

Blood.—Löb, Walther: The clinical detection of blood by means of the benzidin reaction.—Apoth.-Ztg. 1914, v. 29, p. 335.

Schirokauer, Hans: The phenolphthalein test for occult blood according to Boas.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1472. See also p. 1617–1618, and reply by Boas, p. 1618.

Rodillon, Georges: A method for augmenting the sensitiveness of the Telmon method for the detection of blood in organic liquids.—Bull. sc. pharmacol. 1914, v. 21, p. 156–157.

Carter, Granat, and Du Pont: The hemaurochrome reaction described by Davis was found to occur far too frequently in a wide

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variety of diseases to be of any specific importance.—J. Am. M. Assoc. 1914, v. 62, p. 1807–1808.

Chlorides.—Rogée, H.: Methods for the determination of chlorides in urines.—Apoth.-Ztg. 1914, v. 29, p. 150–151.

Strauss, H.: A simple method for the determination of sodium chloride in urine.—Münch. med. Wchnschr. 1914, v. 61, p. 606.

Anon.: The determination of chlorine in urine by the Volhard method and by the method described by Mohr; direct titration with 0.1 N silver solution with potassium chromate as indicator.—Südd. Apoth.-Ztg. 1914, v. 54, p. 122.

Blasucci, E.: An illustrated description of an apparatus for the estimation of chlorides in the urine.—J. Am. M. Assoc. 1914, v. 62, p. 1399–4000.

Wunder, K.: Simple methods for the determination of sodium chloride nitrogen and the electrolytes in human urine.—Münch. med. Wchnschr. 1914, v. 61, p. 2436–2437.

McLean and Selling: Contribution on the further simplification of the quantitative determination of chlorides in the urine.—J. Am. M. Assoc. 1914, v. 62, p. 1081–1082.

Indican.—Baar, Gustav: The Obermeyer test for indicanuria.—Merck's Arch. 1914, v. 16, p. 73.

Rossi, A.: The greenish tint assumed by urine when it is heated, after having been treated with Obermeyer's reagent, is a good index of the proportion of indican in it.—J. Am. M. Assoc. 1914, v. 62, p. 1209.

Rhein, M.: The technic of the Jaffé indican test.—Münch. med. Wchnschr. 1914, v. 61, p. 1503. See also Freeman, Rowland Godfrey.—J. Am. M. Assoc. 1914, v. 63, p. 1803.

Dorner, G.: Report of 26 case histories which confirm the belief that the appearance of indican in the blood serum is indicative of uremia.—J. Am. M. Assoc. 1914, v. 62, p. 1128.

Editorial: Indicanuria; its value for differential diagnosis.—Lancet, 1914, v. 186, p. 1736.

Askenstadt, Fritz C.: Further observations on indicanuria.—J. Am. Inst. Homœop. 1914, v. 6, p. 1024–1031.

Sulphur.—Salkowski, E.: On the combinations of sulphur occurring in the urine.—Ztschr. physiol. Chem. 1914, v. 89, p. 485–510.

Gauvin, R.: The determination of sulphur in different conditions in biological liquids more particularly a rapid method applicable to urine.—Bull. sc. pharmacol. 1914, v. 21, p. 341–355.

Sugar.—Beckers, Wilhelm: On the utilization of solution of lead subacetate and powdered charcoal for decolorizing diabetic urine.—Südd. Apoth.-Ztg. 1914, v. 54, p. 463–464.

Ludwig, Krauss: Polarization before and after inversion is the most satisfactory method for determining saccharose in urine.—Südd. Apoth.-Ztg. 1914, v. 54, p. 531–532.

Digitized by Google

Lohnstein, Theodor: Further contribution to the saccharimeter question.—Apoth.-Ztg. 1914, v. 29, p. 335. See also Anon.: Apoth.-Ztg. 1914, v. 29, p. 22; and Pamfil: Pharm. Post, 1914, v. 47, p. 342–343.

Kleiner, Simon B.: A clinical method for the rapid estimation of dextrose in urine by use of a solution containing copper sulphate, sodium citrate, sodium carbonate.—J. Am. M. Assoc. 1914, v. 62, p. 1307.

Rabe, F.: Critical comments on the Nylander test for sugar in urine. As a qualitative test, it is to be preferred to the Fehling test.—Apoth.-Ztg. 1914, v. 29, p. 554.

Järvinen, K. K.: A method for determining sugar in urine; a modification of the Almén-Nylander method.—Pharm. Zentralh. 1914, v. 55, p. 782.

Parnell, G. C.: A clinical test for the estimation of the percentage of glucose. An adaptation of Moore's test.—Brit. M. J. 1914, v. 2, p. 12.

Riegler, E.: A simple colorimetric method for the determination of sugar in urine. The residual blue color of an alkaline glycerin copper solution.—Ztschr. Anal. Chem. 1914, v. 53, p. 245–249.

Bennett, O. E.: Boiling Fehling's solution in glass vessels.—Pharm. J. 1914, v. 92, p. 54. See also Mayer, Joseph L.: Merck's Rep. 1914, v. 23, p. 170–171.

Dimmock, A. F.: A simple method for determining the amount of glucose in diabetic urine and other liquids.—Brit. M. J. 1914, v. 2, p. 399.

van Ekenstein and Blanksma: The determination of levulose in urine.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 818–822.

Blanc, Marius: A table of methods for determining glucose in urine and its differentiation from other related substances.—J. pharm. Anvers, 1914, v. 70, p. 123; also Schweiz. Apoth.-Ztg. 1914, v. 52, p. 86.

Weinberger, William: An improvement of the Benedict method for the determination of sugar in the urine.—Am. J. M. Sc. 1914, v. 147, p. 407–408.

Mayer, Joseph L.: Quantitative estimation of glucose in urine using a modified Benedict's method.—Proc. New York Pharm. Assoc. 1914, p. 298–299; also J. Am. Pharm. Assoc. 1914, v. 3, p. 1120–1121, and Am. Druggist, 1914, v. 62, p. 286.

Kraus, Oscar: A comment on a new method for the microanalysis of sugar by L. Michaelis, claiming priority.—Biochem. Ztschr. 1914, v. 60, p. 344.

Utz: A review of some contributions on the determination of sugar in the urine.—Pharm. Post, 1914, v. 47, p. 450–452.

Digitized by Google

Urea.—Mestrezat, W.: On the determination of small quantities of urea by the sodium hypobromite method with an illustrated description of a new ureometer.—J. pharm. et chim. 1914, v. 10, p. 100–108; also Compt. rend. Soc. biol. 1914, v. 77, p. 41–43.

Tsakalotos, D.-E.: An illustrated description of a new form of ureometer.—J. pharm. et chim. 1914, v. 9, p. 287–288. See also Rodillon, G.: Bull. sc. pharmacol. 1914, v. 21, p. 395–399.

Robinson, Charles J.: An improved technic for the Doremus-Hinds ureometer.—J. Am. M. Assoc. 1914, v. 62, p. 514–516.

Puckner, W. A.: Urease, a preparation of the urealytic enzyme obtained from the soy bean, *Soja hispida*, may be employed in the determination of the amount of urea in the urine, blood, and other body fluids.—J. Am. M. Assoc. 1914, v. 63, p. 165.

Plimmer and Skelton: The quantitative estimation of urea and indirectly of allantoin in urine by means of urease.—Biochem. J. 1914, v. 8, p. 70–73.

Van Slyke and Cullen: The preparation of soy bean urease in solid form and its use in urea determination.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 56–57. See also p. 155.

Annett, H. E.: The urease content of certain Indian seeds.—Biochem. J. 1914, v. 8, p. 449–452.

Hahn and Saphra: A simple and practical method for the quantitative determination of urea in urine.—Deutsch. med. Wchnschr. 1914, v. 40, p. 430–431.

Fosse, R.: The quantitative gravimetric determination of urea in urine.—Bull. sc. pharmacol. 1914, v. 21, p. 507–509. See also p. 74–77, 502–507; and Compt. rend. Acad. sc. 1914, v. 158, p. 1076–1079, 1588–1590.

Hale, William J.: The constitution of acetylacetone-urea. A report of experimental work.—J. Am. Chem. Soc. 1914, v. 36, p. 104–115.

Anon.: A review of some recent literature relating to the determination of urea.—Südd. Apoth.-Ztg. 1914, v. 54, p. 512.

Uric acid.—Autenrieth and Funk: The colorimetric determination of uric acid in blood and in urine.—Münch. med. Wchnschr. 1914, v. 61, p. 457–461; also Apoth.-Ztg. 1914, v. 29, p. 224–225.

Høst, H. B.: Color test for uric acid in the urine.—(Norsk Magazin for Lægevidenskaben, v. 75, July, No. 7) J. Am. M. Assoc. 1914, v. 63, p. 714.

Bernard, M.: The determination of uric acid in urine.—Apoth.-Ztg. 1914, v. 29, p. 715–716. See also Schmiedel, R.: Südd. Apoth.-Ztg. 1914, v. 54, p. 3.

Phillips, H. Adie: The determination of uric acid; a review.—Pharm. J. 1914, v. 92, p. 60.

Digitized by Google

Gudzent, F.: Observations on anomalies and solubility of uric acid (colloidal uric acid).—Ztschr. physiol. Chem. 1914, v. 89, p. 253–254.

Kohler, Rudolf: Further investigation on the complex formations in solutions of uric acid and uric-acid salts.—Ztschr. physiol. Chem. 1914, v. 88, p. 259–271.

Minkowski, O.: Comments on the hypothesis of uric-acid formation in the organism. A reply to the remarks by Max Dohrn.—Ztschr. physiol. Chem. 1914, v. 88, p. 159–162.

Abl, R.: Pharmacologic regulation of the elimination of uric acid.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 119–163.

Porter, William Henry: Uric acid overproduction.—Med. Rec. 1914, v. 85, p. 1105–1112.

Cammidge reaction.—Cammidge, P. J.: The Cammidge pancreatic reaction depends on the formation of an osazone by the pentose (xylose) split off from the dextrin by hydrolyzing with hydrochloric acid.—J. Am. M. Assoc. 1914, v. 63, p. 2063. See also Editorial, p. 1581–1582.

Pekelharing and Van Hoogenhuyze: A critical review of the Cammidge reaction.—Ztschr. physiol. Chem. 1914, v. 91, p. 151–164.

Spaeth, Eduard: A review of recently published opinions on the Cammidge reaction. Practically all of the results reported indicate that the reaction is of no diagnostic importance for diseases of the pancreas.—Südd. Apoth.-Ztg. 1914, v. 54, p. 388.

FECES.

v. d. Heide: The determination of calcium in feces and in urine. A critical review of the method proposed by Aron.—Biochem. Ztschr. 1914, v. 65, p. 363–380. See also Gutmann, S., p. 470–471.

Wagner, A.: Dry test for occult blood in stools. A simplified benzidine test which can be applied without an ether extract.—(Zentralbl. Chir. 1914, v. 41, No. 28) J. Am. M. Assoc. 1914, v. 63, p. 519.

Lyle, Curtman, and Marshall: A study of some of the factors involved in the benzidine test for occult blood.—J. Biol. Chem. 1914, v. 19, p. 445–457.

Schirokauer, Hans: The phenolphthalein test for occult blood according to Boas.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1472.

Gordon, J. Saxon: A method for the determination of the total fats of undried feces and other moist masses.—J. Biol. Chem. 1914, v. 17, p. 99–102.

Gastaldi, G.: Quantitative test for stercobilin in feces.—(Rif. Med. v. 30, August 29, No. 35) J. Am. M. Assoc. 1914, v. 63, p. 2170.

Eppinger and Charnas: The determination of urobilin in the

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stool may have diagnostic import.—J. Am. M. Assoc. 1914, v. 62, p. 82.

GASTRIC CONTENTS.

Smithies, Frank: A study of the value of the quantitative estimation of dissolved albumin in gastric extracts (Wolff-Junghan's test) in the diagnosis of gastric cancer.—Am. J. M. Sc. 1914, v. 147, p. 713–720.

Schwarz, G.: The thread test for gastric acids; technic.—(Deutsch. med. Wchnschr. v. 40, No. 1) J. Am. M. Assoc. 1914, v. 62, p. 579.

Schütz, E.: A report on various methods in vogue for estimating the condition of the stomach contents without and with the stomach tube.—J. Am. M. Assoc. 1914, v. 63, p. 357.

Editorial: The actual acidity of human gastric juice.—J. Am. M. Assoc. 1914, v. 63, p. 580–581. See also v. 63, p. 1584.

SPUTUM.

Holm and Himmelberger: The quantitative determination of albumin in sputum with potassium ferro-cyanide.—J. Am. M. Assoc. 1914, v. 62, p. 20–21.

Callender, Geo. R.: Albumin in sputum and its relation to pulmonary disease.—Med. Rec. 1914, v. 86, p. 783–788.

Lewis, W. Milton: The albumin reaction in the sputum; its lack of clinical importance.—New York M. J. 1914, v. 99, p. 1031–1032.

Cocke, Charles Hartwell: Albumin in the sputum in tuberculosis; its value in diagnosis and prognosis.—Am. J. M. Sc. 1914, v. 148, p. 724–729.

Griffith, A. Stanley: Further investigations on the type of tubercle bacilli occurring in the sputum of phthisical persons.—Brit. M. J. 1914, v. 1, p. 1171–1175.

Bunting, Russell W.: Potassium sulphocyanate in the saliva. The alcohol ether method was found to be positive and practicable.—Dental Cosmos, 1914, v. 56, p. 838–846.

BLOOD.

Terroine, Émile F.: On the water content of the blood.—Compt. rend. Soc. biol. 1914, v. 76, p. 523–526.

Ganassini, Domenico: Chemical researches on, and the reactions of blood.—Boll. chim.-farm. 1914, v. 53, p. 777–781.

Hess, Alfred F.: A test for antithrombin in the blood.—Proc. Soc. Exper. Biol. 1914, v. 12, p. 39–41.

Shaffer, Philip A.: On the determination of sugar in blood. The use of methyl alcohol is not suitable for the extraction of sugar.—J. Biol. Chem. 1914, v. 19, p. 285–295.

Digitized by Google

Lewis and Benedict: A method for the estimation of sugar in small quantities of blood.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 57–58. See also Kowarsky, A.: Pharm. Zentralh. 1914, v. 55, p. 323–324.

Epstein, Albert A.: An accurate microchemical method of estimating sugar in the blood.—J. Am. M. Assoc. 1914, v. 63, p. 1667–1668. See also Michaelis, L.: Biochem. Ztschr. 1914, v. 59, p. 100–112.

Gardner and Maclean: A method for the estimation of sugar in blood, with observations on some modern methods.—Biochem. J. 1914, v. 8, p. 391–403.

v. Hess and McGuigan: The condition of the sugar in the blood.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 45–55.

Autenreith and Montigny: Colorimetric methods for determining sugar in blood.—Münch. med. Wchnschr. 1914, v. 61, p. 1671–1674.

Chelle, Louis: The detection of carbohydrates and of lactic acid in blood and other organic liquids.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 193–217.

Weiss, Richard: The quantitative estimation of uric acid, cholesterin, and sugar in the blood.—New York M. J. 1914, v. 100, p. 180–181. See also Med. Rec. 1914, v. 85, p. 432–433.

Zeigler, Jos.: The determination of uric acid in blood serum.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 493–495.

Steinitz, Ernst: An experimental study on the occurrence of uric acid in the blood.—Ztschr. physiol. Chem. 1914, v. 90, p. 108–123.

Steinitz, Ernst: On the detection of uric acid in blood.—Deutsch. med. Wchnschr. 1914, v. 40, p. 953–956. See also Brugsch and Kristeller: Apoth.-Ztg. 1914, v. 29, p. 237.

Autenrieth and Funk: Observations on the colorimetric determination of uric acid in blood and in urine.—Apoth.-Ztg. 1914, v. 29, p. 224–225.

Kristeller, L.: A simple method for the detection of urea in small quantities of blood.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 496–497.

Farr and Krumbhaar: The relation of urea to the total nitrogen of the blood in hepatic disease. Report of one case.—J. Am. M. Assoc. 1914, v. 63, p. 2214–2216.

Marriott, W. McKim: It is possible to determine acetone, acetoacetic acid, and beta-oxybutyric acid in small amounts of blood drawn directly from a vein.—J. Am. M. Assoc. 1914, v. 63, p. 397–398.

Federer, Max: The determination of al...alies in the blood.—Ztschr. physiol. Chem. 1914, v. 89, p. 232–235.

Gutmann and Schlesinger: On the determination of chlorine in blood serum.—Biochem. Ztschr. 1914, v. 60, p. 283–285. See also Fogée and Fritsch, v. 58, p. 175–176.

Küster, William: Observations on the constitution of hemin.—Ztschr. physiol. Chem. 1914, v. 88, p. 377–388.

Digitized by Google

Piloty, Stock, and Dormam: On the constitution of the coloring matter of blood. Hemopyrroles and phonopyrrolecarboxylic acids.—Ann. Chem. 1914, v. 406, p. 342–374.

Fischer and Eismayer: Contribution to our knowledge of the coloring matter of blood with report of experimental work.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 1820–1828. See also Fischer, Hans, p. 3266–3277.

Breteau, Pierre: The coloring matter of blood. A review of recent researches relative to its constitution.—J. pharm. et chim. 1914, v. 9, p. 563–570.

Utz: Review of some of the literature relating to the coloring matter in blood.—Pharm. Post, 1914, v. 47, p. 472–473.

Bloor, W. B.: A method for the determination of fat in small amounts of blood.—J. Biol. Chem. 1914, v. 17, p. 377–384.

Schirokauer, Hans: Contribution to the technic of the examination of blood. A new plate for counting blood cells.—Berl. klin. Wchnschr. 1914, v. 51, p. 936–937.

Schroeder, F. B.: Simple attachment for blood-counting pipet; illustrated.—J. Am. M. Assoc. 1914, v. 62, p. 455.

For additional comments on clinical tests, blood, see Zentralbl. Biochem. u. Biophys.; Zentralbl. exper. Med.; Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

STAINS.

Krumwiede, jr., and Pratt: Observations on the growth of bacteria on media containing various aniline dyes.—J. Exper. M. 1914, v. 19, p. 20–27.

Jansen, Andrew M.: The disinfectant action of certain bacterial stains.—J. Infect. Dis. 1914, v. 14, p. 255–260.

Mellière, G.: Staining the tubercle bacilli. Formulas for a crystal violet stain.—J. pharm. et chim. 1914, v. 9, p. 23–24.

Churchman, John W.: Notes on the examination of the urine for tubercle bacilli.—Am. J. M. Sc. 1914, v. 148, p. 722–724.

Kuever, R. A.: Formulas for a modified Wright's stain, with method of using it.—J. Am. Pharm. Assoc. 1914, v. 3, p. 95–96.

Henrici, Arthur T.: The staining of yeast by Gram's method.—J. Med. Research. 1914, v. 30, p. 409–415.

Smith, Louis D.: A simplification of the Gram stain.—J. Am. M. Assoc. 1914, v. 62, p. 1251.

v. Iljinsky, M.: The staining of histological specimens; a review.—Ztschr. Wiss. Mikros. 1914, v. 31, p. 224–226.

Anon.: Directions for the preparation of Ehrlich's acid hematoxylin.—J. Am. M. Assoc. 1914, v. 63, p. 502.

von Szüts: A new hematoxylin solution using ammonium molybdate as the mordant.—Ztschr. Wiss. Mikros. 1914, v. 31, p. 17–18.

Digitized by Google

Smith, Albert: An illustrated description of a simple mounting instrument.—Pharm. J. 1914, v. 92, p. 205.

Kingsbury, B. F.: A review of the seventh edition of "The Microtomist's Vade-mecum," by Arthur Bolles Lee.—Science, 1914, v. 39, p. 618–619.

CULTURE MEDIA.

St. John, A. D.: A proposed new standard loop for use in bacteriological tests of disinfectants.—J. Ind. & Eng. Chem. 1914, v. 6, p. 940.

Young, C. C.: A new petri dish cover.—J. Am. M. Assoc. 1914, v. 63, p. 1031.

Holman, W. L.: A method for making carbohydrate serum broth of constant composition for use in the study of streptococci.—J. Infect. Dis. 1914, v. 15, p. 209–214.

Lee and Fegely: An experimental study of the relative efficiencies of certain fermentation tubes.—Am. J. Public Health, 1914, v. 4, p. 999–1005.

Hirschfelder, J. P. Culture media for gonococcus.—J. Am. M. Assoc. 1914, v. 62, p. 776.

Seliber, G.: The cultivation of microbes in solutions of caseine.—Compt. rend. Soc. biol. 1914, v. 76, p. 639.

Krumwiede, Jr. and Pratt: Observations on the growth of bacteria on media containing various aniline dyes.—J. Exper. M. 1914, v. 19, p. 20–27.

Schneider, Albert: Bacteriological methods in the examination of foods and drugs.—Merck's Rep. 1914, v. 23, p. 238–240, 270–272, 291–292.

5. VEGETABLE DRUGS.

Editorial: Proposed U. S. P. Changes; a review of Part 2, including the vegetable drugs of the Pharmacopœia.—Pharm. J. 1914, v. 92, p. 507. See also J. Am. Pharm. Assoc. 1914, v. 3, p. 359–416.

Beringer, George M.: A report of approved monographs submitted as standards for unofficial drugs and chemical products, by the committee on unofficial standards.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1597–1602.

Editorial: The organic drugs of the National Formulary. A plea for care in establishing standards for these drugs.—Pract. Drug. 1914, v. 32, p. 477–478.

Xrayser II.: The materia medica changes in the new British Pharmacopœia seem drastic enought to be disquieting.—Chem. & Drug. 1914, v. 85, p. 755. See also Editorial, p. 724–725.

Anon.: The number of crude drugs deleted from the British Pharmacopœia is 51, so that, deducting 3 new ones, the Pharma-

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copœia of 1914 is poorer than its predecessor by 48 crude drugs.—Pharm. J. 1914, v. 93, p. 453.

Noyes, C. R.: Drugs of inferior quality for medicinal purposes sometimes find their way to the retail pharmacist through lack of the proper U. S. P. names and specifications.—J. Am. Pharm. Assoc. 1914, v. 3, p. 605; also Proc. Minnesota Pharm. Assoc. 1914, p. 186.

McCauley, Charles E: Drugs are not always what they are labeled, even though they come from supposedly reliable houses.—Proc. South Dakota Pharm. Assoc. 1914, p. 137.

Kremers, Edward: Our "crude drugs" are frequently exceedingly crude.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1441.

Rippetoe, J. R.: Applied pharmacognosy. A plea for the practical application of pharmacognosic knowledge in the retail drug stores.—Am. J. Pharm. 1914, v. 86, p. 114–120.

Youngken, Heber W.: The relation of pharmacognosy to the practice of pharmacy.—J. Am. Pharm. Assoc. 1914, v. 3, p. 175–176.

Tunmann and Senft: A review of recent literature relating to the pharmacognosy of drugs.—Pharm. Post, 1914, v. 47, p. 267–270, 303–308, 611, 654, 665, 673, 709, 741, 761, 785, 805, 841, 906, 933. See also Schmiedel: Südd. Apoth.-Ztg. 1914, v. 54, p. 11, 18.

Gathercoal, E. N.: The Pharmacognosy Museum, an illustrated description.—J. Am. Pharm. Assoc. 1914, v. 3, p. 17–24.

J. D. Riedel, A.-G.: Interest in synthetic drugs is distinctly on the wane and more attention is being devoted again to the official and unofficial vegetables drugs.—Riedel's Berichte, 1914, p. 29.

Newcomb, Edwin L.: The vegetable drugs of the future, with report of experiments in the cultivation of digitalis and other drugs.—Proc. Minnesota Pharm. Assoc. 1914, p. 148–159; also Northwestern Druggist, 1914, v. 15, July, p. 17–18.

Stockberger, W. W.: Medicinal plant gardens. Some of the popular misconceptions concerning the scope and function of such gardens.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1436–1440. See also Am. J. Pharm. 1914, v. 86, p. 506–511; and J. Am. Pharm. Assoc. 1914, v. 3, p. 143, and p. 166–169.

Kremers, Edward: Cultivation and collection of medicinal plants; illustrated.—Bull. Wisconsin Univ. 1914, No. 738, p. 7–17. See also Denniston and Kremers, p. 22–31.

Miller, F. A.: The commercial possibilities in growing medicinal plants.—J. Am. Pharm. Assoc. 1914, v. 3, p. 34–38. See also p. 308–314; Bull. Torrey Bot. Club, 1914, v. 41, p. 105–129; Am. Druggist, 1914, v. 62, p. 367–368; and Lilly Sci. Bull. 1914, Ser. 1, p. 117–120, 127–136, 163–168.

Kraemer, Henry: The cultivation of medicinal plants in America.—J. Am. Pharm. Assoc. 1914, v. 3, p. 111–122.

Digitized by Google

Koch, Felix J.: Putting the roadside weeds to use. An illustrated review of the possibilities of collecting indigenous and naturalized weeds for medicine.—Canadian Drug. 1914, v. 26, p. 345–346.

Schelenz, Hermann: The cultivation of drugs in the past. A review of some of the records of early drug gardens.—Ber. deutsch. pharm. Gesellsch. 1914, v. 9, p. 453–469.

Umney, Ernest A.: The production of drugs and essential oils in Great Britain.—Pharm. J. 1914, v. 93, p. 798–800. See also Greenish, H. G., p. 797; and Whatmough, W. A.: Nature, 1914, v. 94, p. 175–177.

Wijsman, H. P.: The production of drugs in the Dutch colonies.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 99–108.

Thoms, H.: The cultivation of medicinal plants in Germany, with a review of some current literature relating to the problems involved.—Arb. pharm. Inst. Univ. Berl. 1914, p. 200–203. See also Pharm. Post, 1914, v. 47, p. 219; and Südd. Apoth.-Ztg. 1914, v. 54, p. 221.

Anon.: Map of the two hemispheres showing the distribution of plants yielding official drugs.—Southern Pharm. J. 1914, v. 7, p. 40. See also p. 123.

Ragl, Franz Xaver: African plant drugs.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 243–245.

Hartwich, C.: A further report on the study of a collection of Bolivian drugs.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 305–308.

Haüssler, F.: Haitian plants used by the inhabitants of the island as medicines.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 261–264, 275–278.

Goester, L. E.: A review of the drugs of Greater Netherlands, particularly those found in South Africa.—Pharm. Weekblad, 1914, v. 51, p. 1107–1117. See also Apoth.-Ztg. 1914, v. 29, p. 763, 780, 867, 879, 891, 896, 913.

Eijken, P. A. A. F.: The medicines of India.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 943–953.

Editorial: The simples and drugs of India.—Lancet, 1914, v. 186, p. 332.

Hooper, David: Drug cultivation in British India, with a list of the vegetable drugs that come from India.—Montreal Pharm. J. 1914, v. 25, p. 3–6.

Broadbent, W.: A list of drugs suitable for cultivation in the climatic conditions of Australia.—Pharm. J. 1914, v. 92, p. 201.

Kremers, Edward: A book review of a volume on the biochemistry of plants by Friedrich Czapek.—Science, 1914, v. 39, p. 612–615.

Bose, J. C.: The action of drugs on plants.—Lancet, 1914, v. 187, p. 1105–1109.

Digitized by Google

Livingston, B. E.: A book review of a volume entitled "Researches on Irritability of Plants," by J. C. Bose.—Science, 1914, v. 39, p. 511–513.

Farr, E. H.: Recent work on plant products; a review.—Chem. & Drug. 1914, v. 85, p. 162–164; also Year-Book of Pharmacy, 1914, p. 315–325.

Lewis, S. Judd: The mineral constituents of certain tinctures and drugs.—Pharm. J. 1914, v. 92, p. 126–129; also Chem. & Drug. 1914, v. 85, p. 168–170.

de Jong, D. J.: The rational quantitative analysis of inorganic constituents of various plant organs and their products.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 654–655.

Hallier, Hans.: On the utilization of comparative vital chemistry in systematic botany.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 969–978.

Rosenthaler, L.: Pyroanalysis of drugs as a means to identify the drug.—Compt. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 965–968; also Bull. sc. pharmacol. 1914, v. 21, p. 289.

Eder, R.: An illustrated description of an apparatus for microsublimation in vacuo.—Pharm. Zentralh. 1914, v. 55, p. 656–657.

Heyl and Kneip: Micro-sublimation. An illustrated report of some additional work.—Apoth.-Ztg. 1914, v. 29, p. 564–566.

Senft, Eman: A contribution on the microchemistry of several anthraquinones.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 165–166, 181–183, 201–202.

Tunmann, O.: Observations on microchemistry and biology of plants.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 253–280. See also Apoth.-Ztg. 1914, v. 29, p. 120–122; and Pharm. Zentralh. 1914, v. 55, p. 775–780.

Kremers, Edward: A book review of a volume on plant microchemistry by O. Tunmann, with a chapter on the technic of microchemical research as applied to plants.—Science, 1914, v. 39, p. 179–180.

Linke, H.: Report of results obtained in the examination of drugs and preparations.—Apoth.-Ztg. 1914, v. 29, p. 476ff.

Baldwin, Sidney: Cans for drugs; a discussion on proper containers for drugs and preparations.—Pract. Drug. 1914, v. 32, p. 438–439.

Holmes, E. M.: The preservation of vegetable drugs.—Pharm. J. 1914, v. 92, p. 136.

Roth, Richard: Preserving drugs and preparations, with suggestions for the preservation of botanical drugs.—Southern Pharm. J. 1914, v. 6, p. 482–483. See also Bull. Pharm. 1914, v. 28, p. 480.

Digitized by Google

Eberhardt and Eldred: A bibliography of the deterioration of drugs and pharmaceutical products.—J. Am. Pharm. Assoc. 1914, v. 3, p. 38–49.

A book review calls attention to illustrations of drug plants published by Gehe & Co.—Pharm. Post, 1914, v. 47, p. 733.

Tunmann, O.: A review of the Hamburg drug market with some information regarding the quantities and values of the drugs handled in that port.—Apoth.-Ztg. 1914, v. 29, p. 90ff.

Wilbert, M. I.: The source and supply of medicine, with special reference to the interference caused by the existing European war.—Public Health Rep. 1914, v. 29, p. 2715–2718.

Huisking, Charles L.: Report of the N. W. D. A. committee on drug market, with a table showing the advance in the price of the more important drugs.—Proc. N. W. D. A. 1914, p. 235–243.

1. POWDERED DRUGS.

Sayre, L. E.: A review of some of the requirements to be included in the U. S. P. IX.—Proc. Kansas Pharm. Assoc. 1914, p. 20–22.

Schneider, Albert: An outline enumeration of the tissues, cell forms, and cell contents of powdered drugs which require special study.—Pacific Pharm. 1914, v. 7, p. 225–228. See also p. 219.

Rusby, H. H.: In the new Pharmacopœia all drugs are going to be described in powdered form, and it will be expected that the individual pharmacist will be fairly well acquainted with the product in this form.—Proc. New York Pharm. Assoc. 1914, p. 120.

Mittelbach, Wm.: In the identification of the official powders, both simple and compound, the microscope will be necessary.—Proc. Missouri Pharm. Assoc. 1914, p. 107.

Editorial: The U. S. P. should specify a uniform method for powdering, packing, and storing vegetable drugs.—Pacific Pharm. 1914, v. 7, p. 269.

Fernau, Albert: The Ph. Austr. VIII includes a number of requirements that are not complied with even by the best of the available drugs.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Anon.: Every up-to-date pharmacist should include a microscope as a part of his drug-store equipment.—Bull. Pharm. 1914, v. 28, p. 481.

Gray, Arthur W.: Micrometer microscopes. Accurate measurements of length made with micrometer microscopes require careful consideration of the errors to which such instruments are subject.—Bull. Bur. Standards, 1914, v. 10, p. 375–390.

Huss, Harald: Illustrated descriptions of two new microscopes.—Svensk farm. Tidskr. 1914, v. 18, p. 254–256, 271–272.

Digitized by Google

Jentzsch, Felix: The binocular microscope.—J. Roy Micros. Soc. 1914, No. 218, p. 1–16. See also Beck, Conrad, p. 17–23; and Anon.: Schweiz. Apoth.-Ztg. 1914, v. 52, p. 211–215.

Benmosche, M.: For cleaning slides and cover glasses, successive rinsing in a hydroalcoholic solution of sodium hydroxide and a similar solution of nitric acid has been found simple and quite effective.—Med. Rec. 1914, v. 86, p. 257.

2. VALUATION OF VEGETABLE DRUGS.

Editorial: The number of drugs and galenical preparations in the Ph. Brit. V which are required to contain a definite proportion of the chief active constituent is further increased.—Brit. M. J. 1914, v. 2, p. 635. See also Pharm. Era, 1914, v. 47, p. 513; and Bull. Pharm. 1914, v. 28, p. 443.

Bickner, Robert Cooke: Plant chemistry and analysis. Comments on the limits of analytical chemistry.—Nat. Druggist, 1914, v. 44, p. 487–488.

Snider, H. F.: Report of the subcommittee on standardization and drug testing.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 200–204. See also p. 193–197.

Caesar & Loretz: Methods for the standardization of drugs and preparations are outlined.—Jahres-Ber. 1914, p. 43–120.

Buhrer, C.: The variation in the active constituents of drugs and the desirability of limiting this variation.—Compt. rend. Congr. Internat. Pharm. 1913, v. 1, p. 458–459.

Peck, E. Saville: The establishment of a minimum for the active parts of medicine without establishing a maximum is wrong.—Compt. rend. Congr. Internat. Pharm. 1913, v. 1, p. 460–462.

Rippetoe, J. R.: The examination of some drugs, with special reference to the anhydrous alcohol and ether extracts and ash.—Am. J. Pharm. 1914, v. 86, p. 435–444.

Caesar & Loretz: The determination of moisture content of drugs.—Jahres-Ber. 1914, p. 77.

Plahl, Wilhelm: The detection of extracted umbelliferous seeds.—Arch. Chem. Mikros. 1914, v. 7, p. 209–211.

Neal, P. C.: Of 172 samples of crude drugs examined 153 were accepted and 19 rejected.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

Vanderkleed, C. E.: Table showing the results of 286 crude drug assays. Two hundred and twenty-one samples were found to be above and 64 below the standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

3. ASH DETERMINATION.

Turner, T. E.: In the case of the extractive matter and ash limits, physical constants, etc., there has been a marked advance in the Ph.

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Brit. V.—Chem. & Drug. Australas. 1914, v. 24, p. 430. See also Brit. M. J. 1914, v. 2, p. 759.

Caesar & Loretz: General method for determining the ash content of drugs.—Jahres-Ber. 1914, p. 119–120. See also Riedel's Berichte, 1914, p. 30.

Wilbert, M. I.: Proposed U. S. P. IX limitations for the ash content of drugs. A table showing proposed U. S. P. limitations for ash compared with requirements included in the German, Austrian, Swiss, and Netherlands Pharmacopœias, and the variations reported in recent literature.—Am. J. Pharm. 1914, v. 86, p. 456–460.

Alsberg, C. L.: The limit of ash permitted in fennel, coriander, cardamon, anise, and celery seed.—S.-R. A.-Chem. 1914, p. 529; also Drug. Circ. 1914, v. 58, p. 544–545; and Oil, Paint & Drug Rep. 1914, v. 86, July 27, p. 11.

Maines, E. L.: Report of observations on the ash content of a number of official and nonofficial drugs.—J. Am. Pharm. Assoc. 1914, v. 3, p. 423–427.

J. D. Riedel, A.-G.: A table giving the ash content and extract content of a number of official and unofficial drugs.—Riedel's Berichte, 1914, p. 29–33.

4. GLUCOSIDES.

Farr, E. H.: A review of recent progress in glucosides.—Pharm. J. 1914, v. 92, p. 118–119; also Year-Book of Pharmacy, 1914, p. 319–322, and Merck's Rep. 1914, v. 23, p. 218.

Tschirch, A.: The glucosidases, the enzymes capable of splitting up glucosides, are widely distributed.—Pacific Pharm. 1914, v. 8, p. 12.

Yamashita, J.: A few experiments on glucosides.—J. Pharm. Soc. Japan, 1914, March, p. 227.

Caspari, Charles E.: Determination of santonin in santonica. The method of Fromme is recommended.—J. Am. Pharm. Assoc. 1914, v. 3, p. 634–637.

Schneider and Wrede: The examination of mustard glucosides. V. The constitution of sinigrin.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2225–2229.

Bourquelot, Aubry, Bridel and others: Experimental observations on the synthesis and properties of glucosides.—J. pharm. et chim. 1914, v. 9, p. 62–66, 155–158, 230–236, 343–346, 514–519, 603–606, v. 10, p. 14–18, 23–26, 66–72, 111–116, 202–207, 361–373, 393–412; Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 174–192; Apoth.-Ztg. 1914, v. 29, p. 128–130; Nature, 1914, v. 92, p. 304.

Fischer, Emil: The synthesis of new glucosides. The chemical composition and structural characteristics.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 1877–1893. See also p. 1980–1989.

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E'we and Vanderkleed: Precipitation of glucoside from fluid extract of sarsaparilla, U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 275.

van der Haar, A. W.: The nature and the chemistry of the saponins.—Chem. Weekblad, 1914, v. 11, p. 214–233.

Reich, M.: The microchemical detection of saponins in the plant cells; an abstract.—Pharm. Zentralh. 1914, v. 55, p. 319.

Schaer, Eduard: On the distribution of the saponins in plants.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 990–995; also Bull. sc. pharmacol. 1914, v. 21, p. 291–292.

Rühles, J.: On the detection of saponin.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 192–200.

Asahina and Momoya: The saponins of *Styrax japonica*.—J. Pharm. Soc. Japan, 1914, February, p. 105; also Arch. Pharm. 1914, v. 252, p. 56–69.

Seidell, J. T.: A new angle to the saponin question. Its use in carbonated beverages.—Pure Products, 1913, v. 10, p. 343–345.

For additional comments on glucosides see Zentralbl. Biochem. u. Biophys.; Chem. Zentralbl.; Chem. Abstr.; J. Chem. Soc. Lond.

5. ALKALOIDS.

Anon.: A review of the alkaloids and alkaloidal salts of the Ph. Brit. V 1914.—Chem. & Drug. 1914, v. 85, p. 819–821.

Wester, D. H.: On the localization of alkaloids.—Pharm. Weekblad, 1914, v. 51, p. 229–232; also, Ber. pharm. Gesellsch. 1914, v. 24, p. 125–127.

Sievers, A. F.: Distribution of alkaloids in the belladonna plant.—Am. J. Pharm. 1914, v. 86, p. 97–112. See also Anselmino, O.: Arb. pharm. Inst. Univ. Berl. 1914, p. 34–38.

Gadamer, J.: Observations on the biological importance and the origin of alkaloids.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 35–55.

Tunmann and Senft: A review of some recent literature on the origin of alkaloids in plants.—Pharm. Post, 1914, v. 47, p. 710.

Einbreck, Hans: Progress in the chemistry of alkaloids in 1913.—Fortschr. Chem. 1914, v. 9, p. 189–203.

A book review calls attention to a volume by H. Bauer on the present day status of the synthesis of plant alkaloids.—Ber. pharm. Gesellsch. 1914, v. 24, p. 198; also Apoth.-Ztg. 1914, v. 29, p. 112, and J. Am. Chem. Soc. 1914, v. 36, p. 615.

Farr, E. H.: A review of recent work on alkaloids and on the classification of alkaloids.—Pharm. J. 1914, v. 92, p. 117; also Year-Book of Pharmacy, 1914, p. 316–318, and Merck's Rep. 1914, v. 23, p. 217.

Digitized by Google

Finnemore, H.: The rate of dialysis of alkaloids in aqueous solution and in the form of galenicals.—Pharm. J. 1914, v. 92, p. 123–124: also Year-Book of Pharmacy, 1914, p. 343–345.

v. Friedrichs, Oscar: Observations on the action of mold fungi on the alkaloid content of opium.—Ztschr. physiol. Chem. 1914, v. 93, p. 276–282.

Gordin and Kaplan: Note on the comparative adsorption of different substances by Lloyd's reagent, animal charcoal and aluminum hydroxide, with tables showing the relative proportion of materials adsorbed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 627–630; also Merck's Rep. 1914, v. 23, p. 189–190.

Rehfeld, Gustav: Some facts and demonstrations on Lloyd's reagent and alcresta alkaloids.—J. Am. Pharm. Assoc. 1914, v. 3, p. 710–713.

Lloyd, John Uri: History, origin, qualities, and efficiency of Lloyd's reagent, colloidal hydrous aluminum silicate.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 377–379. See also J. Am. Pharm. Assoc. 1914, v. 3, p. 625.

Fraube and Onodera: On the colloidal state of alkaloids, and the relation between surface tension, molecular size and toxicity.—Internat. Ztschr. physikal.-chem. Biol. 1914, v. 1, p. 35–59.

Mossler, G.: The decomposition of solutions of salts of alkaloids by sterilization. An abstract.—Bull. sc. pharmacol. 1914, v. 21, p. 205–208; also Chem. & Drug. 1914, v. 84, p. 130, Pharm. Era, 1914, v. 47, p. 8–9, and Merck's Rep. 1914, v. 23, p. 70–71.

For additional comments on alkaloids see Zentralbl. Biochem. u. Biophys.; Zentralbl. exper. Med.; Chem. Zentralbl.; Chem. Abstr.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

6. ASSAY PROCESSES.

U. S. P. IX: General directions for alkaloidal assay of crude drugs and galenical preparations.—J. Am. Pharm. Assoc. 1914, v. 3, p. 984–997, and Abstr. Prop. Changes, Part 4, 1914, p. 1–14.

Heebner, Chas. F.: The Ph. Brit. V includes methods of assay for the alkaloidal content of aconite root, belladonna leaves, cinchona bark, ipecacuanha root, opium, and nux vomica.—Canadian Pharm. J. 1914, v. 18, p. 206. See also Pharm. J. 1914, v. 93, p. 447, 619–621.

Turner, T. E.: In standardization there has been some little improvement made in the Ph. Brit. V.—Chem. & Drug. Australas. 1914, v. 24, p. 430. See also Chem. & Drug. 1914, v. 85, p. 480, and p. 484.

Todd, A. R.: The Pharmacopœia should include more methods of assay and more definitions.—Rep. Michigan D. & F. Com. 1914, p. 191.

Digitized by Google

Curry, Gordon L.: The multiplicity of assay processes is not favored.—Proc. Kentucky Pharm. Assoc. 1914, p. 56.

Dichgans, H.: A comparative examination of the pharmacopœial methods of assay for active drugs and their preparations. An experimental basis for international uniformity.—Apoth.-Ztg. 1914, v. 29, p. 283, 293, 306, 319, 330, 342, 356, 368, 378, 391, 403, 414, 427, 441, 462, 487, 498, 516, 519. See also Caesar & Loretz: Jahres-Ber. 1914, p. 46–50; and Fleissig: Schweiz. Apoth.-Ztg. 1914, v. 52, p. 741–745, 757–760.

E'we and Vanderkleed: Interference of aniline colors in alkaloidal assays.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1683.

Zwikker, J. L.: An illustrated description of an apparatus for rapid extraction by ether.—Pharm. Weekblad, 1914, v. 51, p. 21–23.

Marden, J. W.: A study of the methods for extractions by means of immiscible solvents from the point of view of the distribution coefficients.—J. Ind. & Eng. Chem. 1914, v. 6, p. 315–320. See also Marden and Elliott, p. 928–934.

Fritz, Felix: The separatory funnel of early times (seventeenth century).—Chem.-Ztg. 1914, v. 38, p. 712.

Boland, A.: A new separatory funnel, illustrated.—Ztschr. Anal. Chem. 1914, v. 53, p. 503. See also Kreis, Hans: Chem.-Ztg. 1914, v. 38, p. 76; and Reichmann, Erwin, p. 259.

La Wall, Charles H.: A new form of separatory funnel for preventing the formation of emulsions in shaking out with immiscible solvents; illustrated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 498–499; also Merck's Rep. 1914, v. 23, p. 190.

Jones, H. W.: The assay of medicinal tablets containing alkaloids.—Am. Druggist, 1914, v. 62, p. 369.

Dufilho, E.: The volumetric determination of alkaloids in cinchona and its galenical preparations.—Bull. Soc. Pharm. Bordeaux, 1914, v. 54, p. 53–59.

Thomsen, Th. Sv.: The determination of morphine and opium in tincture of opium.—Arch. Pharm. og Chem. Copenhagen, 1914, v. 21, p. 329–336, 357–365.

Ferencz and Dávid: A study of the new silico-tungstic acid method for the quantitative determination of alkaloids.—Pharm. Post, 1914, v. 47, p. 559–563. See also Jensen, H. R.; Evans' An. Notes, 1914, p. 61–63; and Schweiz: Apoth.-Ztg. 1914, v. 52, p. 685–686.

Gordin and Kaplan: Notes on the estimation of morphine and on Lloyd's reagent, with a report of experiments in the extraction of alkaloids by means of Lloyd's reagent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1656–1658; also Am. J. Pharm. 1914, v. 86, p. 461–464, and Merck's Rep. 1914, v. 23, p. 295–296.

Jensen, H. R.: Table showing equivalents for alkaloid estimations.—Evans' An. Notes, 1914, p. 81.

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Lloyd, John Uri: Energy of Lloyd's reagent with solutions of different alkaloids: 1 gm. cocaine hydrochloride requires of reagent about 10 gm.; 1 gm. styrchnine sulphate requires of reagent about 10 gm.; 1 gm. cinchonine sulphate requires of reagent about 10 gm.; 1 gm. cinchonidine sulphate requires of reagent about 10 gm.; 1 gm. quinine bisulphate requires of reagent about 8 gm.; 1 gm. atropine sulphate requires of reagent about 8 gm.; 1 gm. brucine sulphate requires of reagent about 7 gm.; 1 gm. codeine sulphate requires of reagent about 5 gm.; 1 gm. morphine sulphate requires of reagent about 4 gm.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 378.

Wilbert, M. I.: Pure drugs and the public health, with table showing variations in the active principles of drugs reported during the year ending December 31, 1912.—Am. J. Pharm. 1914, v. 86, p. 550–558.

Vanderkleed, C. E.: Presents the following comparison of assays of crude drugs for the years 1909 to 1914, inclusive:

Year.	Total.	Above.	Below.	Per cent above.
Report of—				
1909	395	313	82	79.3
1910	340	291	49	85.6
1911	263	224	39	85.1
1912	298	235	63	78.8
1913	382	264	118	69.1
1914	286	221	65	77.3

Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

7. PHYSIOLOGICAL STANDARDIZATION.

Davis, Lewis: The physiological standardization of drugs. How the strength of drugs is determined and the proper dose found. A popular review with illustrations.—Sc. Am. Suppl. 1914, v. 78, p. 232–234. See also Duncan, C. A.: Southern Pharm. J. 1914, v. 6, p. 342–344, 392.

Haskell, C. C.: Physiological drug testing and the United States Pharmacopœia.—Pacific Pharm. 1914, v. 8, p. 178–182.

Anon.: Physiological standardization finds no recognition in the Ph. Brit. V; neither does serum.—Drug. Circ. 1914, v. 57, p. 690.

Thoms, Hermann: The biological testing of remedies and the desirability of including in the pharmaceutical curiculum experimental laboratory work along these lines.—Apoth.-Ztg. 1914, v. 29, p. 32–33. See also p. 63–64; and Arb. Pharm. Inst. Univ. Berl. 1914, p. 171–186.

Houghton, E. M.: Report of a committee on physiological testing.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1433–1435.

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Heffter, Arthur: Biological standardization is practicable only under conditions affording constant practice and experience.—Apoth.-Ztg. 1914, v. 29, p. 63.

Kobert, R.: Observations on the biological valuation of digitalis preparations.—Apoth.-Ztg. 1914, v. 29, p. 761–763.

Hamner, J. W.: The Focke method for the valuation of digitalis preparations.—Svensk farm. Tidskr. 1914, v. 18, p. 81–87. See also p. 113–116, 137–138, 153–156, 169–171, 195–198, 220–222, 235–237.

Vanderkleed and Pittenger: Variation in susceptibility of the guinea pig.—J. Am. Pharm. Assoc. 1914, v. 3, p. 815–819. See also Haskell, C. C.: Am. J. Pharm. 1914, v. 86, p. 7–11; Lilly Sci. Bull. 1914, Ser. 1, p. 173–177, and p. 199–201.

Meulenhoff, J. S.: The desirability of determining the value of medicinal substances by physiological methods as well as by chemical methods.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 534–552. See also Ruitinga, P., p. 553–558; Ginzberg and Hohlberg, p. 559–613; Joanin, A., p. 614–640.

Holste, Arnold: A report of experiments on the valuation of the heart tonics by means of the isolated frog's heart.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 385–408.

Weis, Edmund: The physiological valuation of strophanthus and the several strophanthins.—Pharm. Post, 1914, v. 47, p. 339–342, 351–354, 360–365.

Pearson, William A.: The physiological standardization of heart tonics.—Am. J. Pharm. 1914, v. 86, p. 61–71; also Merck's Rep. 1914, v. 23, p. 62–65.

Sugimoto, T.: Pharmacological investigations by means of the isolated uterus of the guinea pig, with tracings showing the effect produced by a number of drugs.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 27–40.

Gugenheim, M.: The action of beta-iminazolylethlamine on the human uterus.—Therap. Monatsh. 1914, v. 28, p. 174–175.

Roth, G. B.: Pituitary standardization. A comparison of the physiological activity of some commercial pituitary preparations.—Bull. Hyg. Lab. No. 100, p. 5–42.

Closson, Oliver E.: Time recorder for kymograph tracings.—J. Pharmacol. & Exper. Therap. 1913–1914, v. 5, p. 235–238.

Kobert, R.: On the biological detection and valuation of some of the tannins.—Ber. Deutsch. Pharm. Gesellsch. 1914, v. 9, p. 470–495.

Hale, Worth: A book review of a volume entitled "Biochemic Drug Assay Methods," by Paul S. Pittenger.—J. Am. Chem. Soc. 1914, v. 36, p. 1583. See also Pacific Pharm. 1914, v. 8, p. 63; Am. Pharm. Assoc. 1914, v. 3, p. 777.

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For additional references see Index Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

6. PHARMACEUTICAL PREPARATIONS.

Llewellyn, H. D.: Some preparations of the U. S. P. A number of suggestions for changes in formulas and working directions.—Proc. Missouri Pharm. Assoc. 1914, p. 141–143.

Nixon, C. F.: Some of the formulas for the preparations of the Pharmacopœia and National Formulary are incomplete.—Apothecary, 1914, v. 26, January, p. 20–22.

Rippetoe, J. R.: Many formulas that are official in the U. S. P. or N. F. are practical for small quantities or immediate use, but for large quantities and indefinite future use are not always satisfactory.—Am. J. Pharm. 1914, v. 86, p. 116.

Sudro, W. F.: The pharmacist should have better control of the drugs and preparations that leave his store and to do this he, himself, should do the compounding.—Rep. North Dakota F. Com. 1914, p. 30.

Varnum, Walter H.: In 25 stores of one of the largest cities in Kansas, the following methods were used to produce U. S. P. preparations; by dilution from fluid extracts, 20; by following the Pharmacopœia, 3; by purchase from wholesalers, 2.—J. Am. Pharm. Assoc. 1914, v. 3, p. 500; also Western Druggist, 1914, v. 36, p. 277–278.

Curry, Gordon L.: The classes of U. S. P. preparations that should be made by the retail drug stores.—Proc. Kentucky Pharm. Assoc. 1914, p. 55–60.

Osseward, Cornelius: An analysis of 2,000 prescriptions, showing the nature and kind of articles called for.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1556–1558.

Smith, F. A. Upsher: The chief means of determining the strength of the various potent drugs and their preparations.—Northwestern Druggist, 1914, v. 15, May, p. 21.

Rupp, E.: A compilation of the tests for pharmacopœial preparations proposed by Rupp and his assistants during recent years.—Südd. Apoth.-Ztg. 1914, v. 54, p. 302–303, 314–315, 322–323. See also Apoth.-Ztg. 1914, v. 29, p. 427.

Wratschko, Franz: Observations on the refractodensimetry of tinctures.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 285, 297, 315, 332, 343. See also Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 315, and p. 355–356.

Mossler and Markus: A rapid and simple method for the determination of the alcohol content of tinctures by noting the rise in specific gravity of solutions of the contained extract.—Apoth.-Ztg. 1914, v. 29, p. 466–467.

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Brown, L. A.: Very little attention is being paid to the matter of proper storage of preparations by pharmacists.—Circ. Kentucky Agric. Exper. Sta. 1914, May 1, p. 3.

E'we and Vanderkleed: Lead storage tanks for pharmaceutical preparations. Some galenicals preparations that dissolve lead.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1685.

1. GENERAL FORMULAS.

Curry, Gordon L.: The revisors of the Pharmacopœia have seen fit to give in detail the processes of manufacture of only such preparations as may be made practically in any store.—Proc. Kentucky Pharm. Assoc. 1914, p. 56.

Norwood, T. W.: Suggestions for the improvement of some preparations of the Pharmacopœia and of the National Formulary.—Drug. Circ. 1914, v. 58, p. 390.

2. CHANGES IN STRENGTH.

Anon.: A list of the articles and preparations of the British Pharmacopœia the strength of which has been altered, with a review of the changes.—Pharm. J. 1914, v. 93, p. 453. See also p. 808, and p. 842.

Editorial: From the point of view of the medical practitioner changes of strength of galenical preparations require careful study, notably in respect to tinctures in daily use.—Lancet, 1914, v. 187, p. 901.

Gadd, H. Wippell: The alterations in strength included in the Ph. Brit. V are of considerable moment and call for extended comment.—Pharm. J. 1914, v. 93, p. 494. See also Anon.: Lancet, 1914, v. 187, p. 908; and Drug Topics, 1914, v. 29, p. 168.

Wilbert, M. I.: In the new British Pharmacopœia the provisions of the Brussels Conference Protocol have been generally followed.—Am. J. Pharm. 1914, v. 86, p. 559.

Windolph, J. Fred.: Very many medicinal preparations are stable and do not deteriorate.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 220.

Frary, Guy G.: The great variation of many drug samples from the U. S. P. strength shows that much is still to be accomplished in improving manufacturing methods in our drugs stores.—Rep. South Dakota F. & D. Com. 1914, p. 210.

Woods, Chas. D.: It is rather startling to find that half of the pharmaceutical preparations examined, which are simpler to make than a batch of biscuit, differed more than 10 per cent from the standard.—Off. Insp. Maine Agric. Exper. Sta. No. 61, 1914, p. 103.

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3. STANDARDIZATION.

Mann, E. W.: The principle of standardization of galenicals receives increased recognition in the new Ph. Brit. V.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 50.

Turner, T. E.: The most disappointing feature of the Ph. Brit. V is the absence of any attempt to provide in a decent way standards for prescribed galenicals of the most recent type.—Chem. & Drug. Australas. 1914, v. 24, p. 430.

Herissey, M. H. W.: The need for fixing standards for internationally recognized potent medicaments for which no such standards now exist.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 470–473.

4. REQUIREMENTS.

Williams, Ed. E.: Physical constants of the U. S. P. preparations should be more explicitly given.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Becker, I. A.: The alcoholic preparations of the Pharmacopœia should have the alcohol content of the finished product stated definitely and so adjusted that reasonably close adherence to the process would suffice.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1025.

Franck, H.: The simplification of the examination of drugs and medicines with a table showing the requirements made in connection with a number of substances and the object of the requirements.—Pharm. Zentralh. 1914, v. 55, p. 365–373.

5. GALENICALS.

Editorial: A review of the alterations in composition and strength of galenical preparations included in the Ph. Brit. V.—Brit. M. J. 1914, v. 2, p. 719–720. See also Chem. & Drug. 1914, v. 85, p. 520, 550, 579, 608; and Pharm. J. 1914, v. 93, p. 552.

Anon.: The formulas of the Ph. Brit. V in equivalent imperial weights and measures.—Pharm. J. 1914, v. 93, p. 760–761, 806–807, 840–841, 874–875.

Valeur, Amand: Recent progress in the pharmacy of galenical preparations.—Farm. Españ. 1914, v. 46, p. 55–57, 71–74.

Mills, Ralph: Comment on several U. S. P. and N. F. preparations.—Southern Pharm. J. 1914, v. 6, p. 535–536.

Becker, I. A.: Preparations of the new Pharmacopœia. Comments on recently proposed changes.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1023–1025.

Richter, Erw.: The determination of alcohol in galenical preparations.—Pharm. Ztg. 1914, v. 59, p. 430–431.

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van der Wal, G. H.: The desirability of adopting a uniform method of expressing in degree of weight the alcohol content of medicinal preparations.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 529–533.

Brown, Lucius P.: If the quantity of ingredients stated in the Pharmacopœia is used and the procedure laid down therein followed out, there is no valid excuse for the preparation not being strictly standard.—Bull. Tennessee F. & D. Dept. 1914, p. 8.

Porterfield, W. P.: The practice of diluting strong preparations to a weaker dilution as in the making of tinctures from fluid extracts is very often the source of adulterated samples.—Proc. North Dakota Pharm. Assoc. 1914, p. 78.

Keller, George J.: The fungicidal and antifermentative action of glycerin in galenicals.—Proc. New Jersey Pharm. Assoc. 1914, p. 48–50.

McAnulty, John F., jr.: Some reasons why a pharmacist should make his own preparations.—Proc. New Jersey Pharm. Assoc. 1914, p. 52–53. See also Landmark, Hans: Norges Apotek. Tidsskr. 1914, v. 22, p. 358–360; Dulière, W.: Compt. Rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 463–467; and Drijon, L., p. 468–469.

J. D. Riedel, A. G.: Methods for the examination of fluid galenical preparations of iron.—Südd. Apoth.-Ztg. 1914, v. 54, p. 188–189.

Finnemore, H.: The rate of dialysis of alkaloids in aqueous solution and in the form of galenicals.—Pharm. J. 1914, v. 92, p. 123–124; also Year-Book of Pharmacy, 1914, p. 343–345.

Freund, Hans: The use in the pharmacy of galenical preparations, notably of tinctures, is rapidly decreasing.—Pharm. Zentralh. 1914, v. 55, p. 262.

Pescitelli, Luigi: The use of tinctures and of extracts in therapy.—Boll. chim.-farm. 1914, v. 53, p. 335–345.

6. DECOMPOSITION.

Eldred, Frank R.: The deterioration of pharmaceutical preparations.—Merck's Rep. 1914, v. 23, p. 165–166. See also Lilly Sci. Bull. 1914, ser. 1, p. 151–155; Ederhardt and Eldred, p. 181–193; and J. Am. Pharm Assoc. 1914, v. 3, p. 38–49.

Kebler, L. F.: Drugs do not deteriorate as rapidly as is generally thought, though they do deteriorate to some extent.—Proc. Kentucky Pharm. Assoc. 1914, p. 137.

Roth, Richard: Preserving drugs and preparations.—Southern Pharm. J. 1914, v. 6, p. 482–483; also Bull. Pharm. 1914, v. 28, p. 480, and Pacific Drug Rev. 1914, v. 26, February, p. 12.

Osseward, Cornelius: The Pharmacopœia of the United States does not give positive directions as to how some of the important drugs

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should be cared for and stored.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1555.

Murray, B. L.: One of the greatest laxities in handling drugs and chemicals lies in the use of poor containers.—Proc. N. W. D. A. 1914, p. 257; also Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 33; and Windolph, J. Fred.: Proc. Am. Assoc. Pharm. Chem. 1914, p. 218–225.

DETERIORATION.

Porterfield, W. P.: All pharmaceuticals deteriorate on keeping, and the deterioration is not so much dependent on time alone as on a number of accompanying factors, as light, heat, atmospheric conditions, and general lack of care or technical knowledge in storing of the various substances.—Proc. North Dakota Pharm. Assoc. 1914, p. 78; also Northwestern Druggist, 1914, v. 15, September, p. 38.

Porter, C. S.: Only a small percentage of druggists pay any attention to the storage of drugs and preparations.—Proc. Kentucky Pharm. Assoc. 1914, p. 112.

Dowling, Oscar T.: The variability of pharmaceutical preparations is an argument against oversupply so common in many drug stores.—Proc. Louisiana Pharm. Assoc. 1914, p. 24.

Allen, R. M.: An investigation is to be made, among pharmacists, into the methods of storing perishable drugs.—Rep. Kentucky Agric. Exper. Sta. 1911–1913, Lexington, 1914, p. 3.

Rees, D. R.: Grave lack of uniformity exists in handling highly potent drugs or chemicals.—Pacific Drug Rev. 1914, v. 26, July, p. 16.

Reinders, W.: The chemical action of light. A review.—Chem. Weekblad, 1914, v. 11, p. 282–301.

Sernagiotto and Hoschek: On the suspected chemical changes produced by light.—Ztschr. physiol. Chem. 1914, v. 90, p. 437–440.

Rosenthaler, L.: The evident changes due to deterioration in some of the newer chemicals on keeping.—Pharm. Zentralh. 1914, v. 55, p. 589; also Pharm. Post, 1914, v. 47, p. 535–537.

Rogoff, J. M.: A report on deterioration of solutions of morphine, atrophine, pilocarpine, and strychnine. The results indicate a gradual deterioration of these solutions with age.—J. Am. Pharm. Assoc. 1914, v. 3, p. 895.

7. INCOMPATIBILITY.

Stephenson, Thos.: Incompatibility in prescriptions and how to avoid it.—Prescriber, 1914, v. 8, p. 49–51, 177–179, 301–302.

Finnemore, Horace: There are many examples of incompatibility which are not capable of a simple explanation but require pharmaceutical work for their complete elucidation.—Brit. M. J. 1914, v. 1, p. 790.

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Scoville, W. L.: The incompatibility of quinine sulphate and aspirin is probably due to the fact that quinine is changed by organic acids into an isomeric poisonous body known as quinotoxin.—Bull. Pharm. 1914, v. 28, p. 527.

Bianchini, Gino: On the incompatibility existing between salol, sulphonal, and beta naphthol.—Atti accad. Lincei, 1914, v. 23, I, p. 608–615.

Finnemore, H.: The incompatibility of strychnine and nux vomica with alkalies, iodides, and bromides.—Pharm. J. 1914, v. 92, p. 697; also p. 745; also Year-Book of Pharmacy, 1914, p. 346–351. For discussion see p. 351–355, and Merck's Rep. 1914, v. 23, p. 242–243.

Guyot, R.: Incompatibility of urotropin in mixtures with lithium benzoate and other substances.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 60–64.

Mannich, C.: Incompatibility of antipyrine and hexamethylenamine.—Pharm. Post, 1914, v. 47, p. 538, and abstract: Merck's Rep. 1914, v. 23, p. 278.

Bouyer, J.: The incompatibility of sodium borate and cocaine hydrochloride. An illustrated description of the crystals observed.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 64–69.

Lespinasse, Albert: The incompatibility between tincture of iodine and Van Swieten's solution of mercuric chloride.—Bull. sc. pharmacol. 1914, v. 21, p. 463–464.

Gregory, William M.: Variation in drugs. Some notes based on 20 years of dispensing.—New York M. J. 1914, v. 99, p. 884.

Schneider, Albert: A table of chemical incompatibilities:

	Alkaloidal solutions.	Metallic solutions.	Solutions of lead and silver salts.	Solutions of calcium salts.	Solutions of magnesium salts.	Solutions of albumen and gelatin.
Alkalies	P	P	P	P	P	
Tannic acid	P	P	P			P
Carbonic acid and carbonates	P	P	P	P	P	
Sulphuric acid and sulphates			P	P		
Phosphoric acid and phosphates	P	P	P	P	P	
Boric acid and borates	P	P	P			
Hydrochloric acid and chlorides			P			
Hydrobromic acid and bromides			P			
Hydriodic acid and iodides			P			
Sulphides		P	P			
Arsenical preparations		P	P			
Albumen		P	P			

Pacific Pharm. 1914, v. 7, p. 222.

8. PERCOLATION.

Patterson and Lentz: Report of the results obtained by fractional percolation of powdered drugs.—Proc. Maryland Pharm. Assoc. 1914, p. 103–106.

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Maines and Gardner: Total extractive as a factor in fluid extract manufacture, with a table showing the total extractive of fluid extracts examined.—J. Am. Pharm. Assoc. 1914, v. 3, p. 997–1000.

Ramsay, C. F.: The manufacture of fluid extracts. A discussion of precautions to be observed in exhausting different drugs.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1646–1648.

Hamilton, H. C.: A discussion of the menstrua used for the extraction of preparations of digitalis, squill, and convalaria with some observations on the average potency of samples of the resulting preparations.—Am. J. Pharm. 1914, v. 86, p. 56–61.

Wilbert, M. I.: The international standard menstruum of 70 per cent alcohol is more satisfactory as a solvent for the active constituents of potent drugs than is 50 per cent alcohol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1663.

Anon.: Discussion of methods for recovering the liquid in the dregs or marc left in the percolate after the process of percolation.—N. A. R. D. Notes, 1914, v. 18, p. 164.

9. EXTRACTION.

Maines and Gardner: A No. 16 to No. 20 powder is to be preferred for percolation. A finer powder than this clogs up in the percolator and does not admit of complete exhaustion.—Merck's Rep. 1914, v. 23, p. 275.

Ramsay, C. F.: The addition of glycerin to a menstruum often retards percolation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1647.

Anon.: An illustrated description of a modified Soxhlet apparatus for the complete extraction of powdered drugs.—Svensk farm. Tidskr. 1914, v. 18, p. 317–318.

Anon.: Evaporation in theory and practice. Evaporation by means of steam under boiler pressure. An illustrated description of some apparatus.—Pharm. J. 1914, v. 92, p. 284–286, 784–788.

10. STERILIZATION.

Anon.: The new National Formulary is to contain a chapter on sterilization.—Pract. Drug. 1914, v. 32, p. 412.

Becker, L. A.: For the pharmacist's protection against prosecutions as to the possible source of infection the process of sterilization outlined in the Pharmacopœia should produce unquestionable results.—J. Am. Pharm. Assoc. 1914, v. 3, p. 901.

Møller, N. L.: An illustrated description of a simple apparatus for sterilizing preparations at the prescription counter.—Arch. Pharm. og Chem. Copenhagen, 1914, v. 21, p. 533–534.

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Hitchens, A. Parker: A review of sterilization, with some suggestions as to sterilization by means of dry heat, steam, and steam under pressure; also consideration of sterilization by chemical methods and by filtration.—J. Am. Pharm. Assoc. 1914, v. 3, p. 792–798.

Seiffert and Spiegel: A glycerin bath heated to about 120° will fulfill all necessary requirements for the sterilization of instruments and other articles.—Südd. Apoth.-Ztg. 1914, v. 54, p. 546.

Anon.: Sterilization of vegetable drugs, with some reference to the work of Bourquelot.—Southern Pharm. J. 1914, v. 6, p. 438.

Toplis, W. G.: Sterilization in pharmaceutical processes.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 361–363.

Wilbert, M. I.: The only safe and reliable direction for sterilization is the very simple one outlined in the German Pharmacopœia: "Sterilization should be done in accordance with established bacteriological technic."—J. Am. Pharm. Assoc. 1914, v. 3, p. 798.

Mitchell, O. W. H.: General discussion of sterilization and the destruction of bacteria; with illustrations.—Southern Pharm. J. 1914, v. 6, p. 246–248, 297–298.

Book review of a volume by Rudolf Abel on bacteriological technic.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 144.

van Ketal, B. A.: On the importance of the study of bacteriology for the student of pharmacy.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 988–989.

Slee, Arthur M.: Sterilization and disinfection. Practical directions for the general practitioner.—Am. J. Clin. Med. 1914, v. 21, p. 50–54.

Mossler, G.: Observations on the decomposition of solutions of salts of alkaloids by sterilization.—Bull. sc. pharmacol. 1914, v. 21, p. 205–208; also Pharm. Era, 1914, v. 47, p. 8–9; and Merck's Rep. 1914, v. 23, p. 70–71.

Hofman, J. J.: Table showing the effect of sterilization on various solutions used for subcutaneous injection.—Rev. Internat. Pharm. Brux. 1914, v. 2, p. 20.

Sleeswijk, J. G.: Sterilization by means of ultra-violet rays.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 1047–1051. See also von Recklinghausen, M.: J. Frankl. Inst. 1914, v. 178, p. 681–704.

Rideal, B. and E.: The sterilization of water by means of light; a review.—Chem. World, 1914, v. 3, p. 223–224.

11. FORMS OF ADMINISTRATION.

Hart, Joseph: A water bath is indispensable for the extemporaneous preparation of solutions.—Pacific Drug Rev. 1914, v. 26, March, p. 12.

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Brav, Aaron: Drugs used in ophthalmic practice should always be dispensed in a freshly made solution.—Pract. Drug. 1914, v. 32, p. 430.

Peck, E. Saville: Uniformity in the dispensing of abnormal prescriptions. A suggested code of rules.—Chem. & Drug. 1914, v. 85, p. 176–178.

Becker, Henry C.: The saltiness of the alkaline bromides is a distressing feature to overcome. For this purpose a fluid extract of licorice and the aromatic sirup of yerba santa is useful.—Merck's Arch. 1914, v. 16, p. 36.

Editorial: Chloroform is a useful preservative for water dispensed medicine. If used sparingly, it is agreeable to most persons.—Eclectic M. J. 1914, v. 74, p. 659.

Crabbé, Maurice: The relations existing between the chemical structure and therapeutic properties of various substances.—J. pharm. Anvers, 1914, v. 70, p. 161–183.

Editorial: The scientific use of drugs. A review of a paper by Wright.—Pharm. J. 1914, v. 92, p. 26.

AMPOULES.

Hofman, J. J.: The preparation of subcutaneous injections in the form of ampoules, with a table showing the per cent strength of the solutions and the method of sterilizing, the kinds of glass used, the quantities to be dispensed, and the size of the ampoules.—Pharm. Weekblad, 1914, v. 51, p. 117–122; also Rev. Internat. Pharm. Brux. 1914, v. 2, p. 17–20; and Pharm. Post, 1914, v. 47, p. 327–328.

Cambronero, Saturnino: An illustrated description of an apparatus for the automatic filling of ampoules.—Farm. Españ. 1914, v. 46, p. 7–9. See also Richter, Ernst: Apoth.-Ztg. 1914, v. 29, p. 697; and Lütt, E., p. 956.

Kollo, Konstantin: Some further observations on the filling and sterilizing of ampoules.—Südd. Apoth.-Ztg. 1914, v. 54, p. 69–70. See also Anon.: Apoth.-Ztg. 1914, v. 29, p. 879.

Anon.: An ampoule filler for prescription use, illustrated.—Am. Druggist, 1914, v. 62, p. 17.

Lascoff, J. Leon: Camphorated oil in ampoules, simple apparatus for filling, illustrated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 689–691. See also D.-A. Apoth.-Ztb. 1914, v. 35, p. 2–3.

CACHETS.

Norlinger, H.: An illustrated description of a new method for administering drop doses of medicines in the form of starch capsules.—Münch. med. Wchnschr. 1914, v. 61, p. 1732.

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Peck, E. Saville: When a drug is prescribed in powder form without further specifications, the use of cachets is advocated.—Year-Book of Pharmacy, 1914, p. 422.

Keenan, Thomas J.: An illustrated description of an ingenious powder weighing, folding, and sealing machine.—Pract. Drug. 1914, v. 32, p. 485.

CAPSULES.

Anon.: An illustrated description of machines for making empty gelatin capsules.—Oil, Paint & Drug Rep. 1914, v. 86, October 5, p. 36. See also v. 85, April 13, p. 63, and June 1, p. 35.

Forret, J. A.: An illustrated description of an apparatus for trimming gelatin capsules.—Pharm. J. 1914, v. 92, p. 99–100.

Messinger, M. L.: The increasing use and advantages of the gelatin capsule.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 353–354.

Carrier, Ralph G.: An illustrated description of a method of filling capsules by hand.—Bull. Pharm. 1914, v. 28, p. 204–205. See also **Apple**, Franklin, M..: J. Am. Pharm. Assoc. 1914, v. 3, p. 1562.

Epplen, W. G.: The addition of a few drops of a high grade of liquid petrolatum to a mixture of drugs or chemicals to be triturated will aid wonderfully.—Bull. Pharm. 1914, v. 28, p. 296.

Grosh, Daniel M.: An illustrated description of an automatic capsule filler.—Bull. Pharm. 1914, v. 28, p. 427.

Blair, H. C.: The filling of soft capsules.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 236–237. See also **Moulton**, Wm. C.: Bull. Pharm. 1914, v. 28, p. 207.

J. D. Riedel, A. G.: Many of the filled gelatin capsules on the market do not comply with the claims made for them.—Südd. Apoth.-Ztg. 1914, v. 54, p. 189; also Riedel's Berichte, 1914, p. 45–48.

Briggs, C. H.: While capsules themselves do not vary in size, the weight of the contained material usually varies considerably.—J. Am. Pharm. Assoc. 1914, v. 3, p. 31.

Cook, E. F.: Formalized gelatin capsules. Used for medicines which are apt to produce gastric disturbances.—Am. J. Pharm. 1914, v. 86, p. 185–186. See also **Ballenger** and **Elder**: J. Am. Pharm. Assoc. 1914, v. 3, p. 736–738; and **DeLaney**, M. A.: J. Am. M. Assoc. 1914, v. 63, p. 1506, from Military Surgeon, v. 35, October, No. 4.

COMPRESSED TABLETS.

Kebler, L. F.: The tablet industry—its evolution and present status—the composition of tablets and methods of analysis.—J. Am. Pharm. Assoc. 1914, v. 3, p. 820–848, 937–958, 1062–1079.

Jones, H. W.: The assay of certain medicinal tablets, including tablets containing salicylates and tablets containing alkaloids.—Am. Druggist, 1914, v. 62, p. 369–370.

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Lieungh, Frode: The making of compressed tablets. An introduction to the general subject.—Norges Apotek. Tidsskr. 1914, v. 22, p. 143–146, 235–255.

Grosh, Daniel M.: Tablet making 25 years ago and the rapid spread of the tablet industry.—Pharm. Era, 1914, v. 47, p. 410; also Bull. Pharm. 1914, v. 28, p. 426, and Montreal Pharm. J. 1914, v. 25, p. 200–203.

Markus, F.: An illustrated description of an automatic compressing device for tablets.—Pharm. Post, 1914, v. 47, p. 486. See also Apoth.-Ztg. 1914, v. 29, p. 310–311; and Pharm. Zentralh. 1914, v. 55, p. 166.

Fantus, Bernard: The making of tablets by the retail druggist, with directions for granulating the necessary material.—J. Am. Pharm. Assoc. 1914, v. 3, p. 72–75.

Anon.: A number of formulas for preparing simple and complex compressed tablets.—Vrtljschr. prakt. Pharm. 1914, v. 11, p. 159–164.

E'we and Vanderkleed: Compression of tablets.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 277.

Lundin, P. E.: A suggestion to use starch to facilitate the disintegration of tablets. A mixture of arrowroot and wheat starch is recommended.—Pharm. Ztg. 1914, v. 59, p. 548–549.

Fantus, Bernard: Compressed tablets made with cacao butter are satisfactory for extemporaneous preparation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 662.

Smith, F. A. Upshur: The suggestion to use oil of theobroma in the production of granulations for making compressed tablets was presented by Edmund White as early as 1902.—J. Am. Pharm. Assoc. 1914, v. 3, p. 887.

Briggs, C. H.: The variation in weight of compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 31–33.

Rehm, R.: Commercial tablets leave much to be desired. Many of them are compressed too hard. Others are not uniform in weight.—Pharm. Ztg. 1914, v. 59, p. 362–363. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 398.

Fantus, Bernard: Tabellæ dulces, sweet tablets for children's medication.—J. Am. Pharm. Assoc. 1914, v. 3, p. 656–660.

Searle, C. H.: Tablets containing oils frequently have formulas that are ridiculous.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 181. See also Windolph, J. Fred, p. 221.

SUPPOSITORIES.

Mittelbach, Wm.: The U. S. P. process for making suppositories is to be improved. The cacao butter mixture is to be divided and pressed into proper form by means of the old suppository mold.—Proc. Missouri Pharm. Assoc. 1914, p. 107.

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Wulff and Hillen: An illustrated description of a bougie mold.—Pharm. Post, 1914, v. 47, p. 343.

Fürst, Solomon: A method for making tannic acid and belladonna suppositories.—Pharm. J. 1914, v. 92, p. 125.

Lansens, J.: Ovules of tannin with directions for making the gelatin base.—Ann. Pharm. Louvain, 1914, v. 20, p. 1–2.

TABLET TRITURATES.

Todd, A. R.: It is impossible to include in the U. S. P. or N. F. every available triturate and one of these books might include a general provision reading somewhat like the following: "All tablet triturates shall contain that quantity of medicinal substance which is represented on the container thereof."—Rep. Michigan D. & F. Com. 1914, p. 191.

Grosh, Daniel M.: An illustrated description of an automatic tablet triturate and hypodermic tablet machine.—Bull. Pharm. 1914, v. 28, p. 425. See also Pract. Drug. 1914, v. 32, p. 88.

12. METHODS OF ADMINISTRATION.

Luff, Arthur P.: The art of prescribing; a review.—Brit. M. J. 1914, v. 1, p. 633–635. See also Editorial, p. 668–669.

Hatcher and Eggleston: Studies on the absorption of drugs.—J. Am. M. Assoc. 1914, v. 63, p. 469–473; also Tr. Am. Assoc. Sec. Pharm. & Therap. 1914, p. 24–36.

Anderson, John F.: Some unhealthy tendencies in therapeutics. The parenteral administration of medicines appears to have cast a spell not only over the laity, but also on some physicians.—J. Am. M. Assoc. 1914, v. 63, p. 1–3; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 17–23.

Editorial: The craze for hypodermic medication in Italy. A review of an article by Ferreri.—Lancet, 1914, v. 186, p. 626.

Lesure, André: Suspensions in oil, of simple substances (metallic or nonmetallic), for intramuscular injection.—J. pharm, et chim. 1914, v. 9, p. 537–542.

Bunch, J. L.: Some continental methods of treating syphilis. The methods of administering mercury.—Practitioner, 1914, v. 92, p. 255–260.

Pratt, J. P.: Description of an apparatus for intratracheal insufflation. Illustrated.—J. Am. M. Assoc. 1914, v. 62, p. 37.

Arndt, H.: An illustrated description of a combination atomizer and inhaler.—Pharm. Zentralh. 1914, v. 55, p. 112.

Hess, Alfred F.: The mouth drip; a method of administering fluid to infants in gastroenteritis (alimentary intoxication); illustrated.—J. Am. M. Assoc. 1914, v. 62, p. 452.

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Bürgi, E.: Observations on the actions of mixtures of medicines.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 411–412. See also abstract J. Am. M. Assoc. 1914, v. 62, p. 1590.

Pöhlmann, A.: A contribution on idiosyncrasy to drugs.—Münch. med. Wchnschr. 1914, v. 61, p. 543–544.

Rice, Philip: Drug proving methods of the future; a review.—Am. J. Inst. Homœop. 1914, v. 6, p. 1133–1136. See also Wherry, C. A., p. 617–621.

Smith, Alden E.: Homœopaths must look at the action of drugs from two viewpoints, the physiological and the dynamic.—J. Am. Inst. Homœop. 1914, v. 6, p. 889.

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II. INTERNATIONAL STANDARDS.

1. THE EVOLUTION OF UNIFORMITY IN PHARMACOPŒIAL STANDARDS FOR POTENT MEDICAMENTS.

1. STANDARDS AND TESTS.

Tschirch, A.: International activities in the field of pharmacy, with suggestions for further development of international standards.—Schweiz.-Apoth.-Ztg. 1914, v. 52, p. 45–49.

Remington, J. P.: The world-wide movement for unification of pharmacopœial standards is a large proposition and involves the requirement that certain widely used products should be of the same purity and quality and comply with the same tests of purity and identity in all parts of the world.—Proc. N. A. M. M. P. 1914, p. 35; also J. Am. Pharm. Assoc. 1914, v. 3, p. 863; Am. Druggist, 1914, v. 62, p. 201; and Pract. Drug. 1914, v. 32, p. 332.

Bruntz and Trimbach: A review of the proceedings of the Eleventh International Congress of Pharmacy.—Bull. sc. pharmacol. 1914, v. 21, p. 77ff.

Mouliets, L.: A review of the proceedings of the international congress at the Hague.—Bull. Pharm. soc. Bordeaux, 1914, v. 54, p. 41–47.

Herissey, M. H. W.: The need for fixing standards for internationally recognized potent medicaments for which no such standard now exists.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 470–473.

Bührer, C.: The unification of the demands for purity of chemical products.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 643–645.

van der Haar, A. W.: Codification of the purity requirements for chemical products.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 646–648.

Berl, E.: The unification of standards for volumetric solutions, their production, use, and purity.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 649–654.

Hercod, E.: Proposition for adoption of an international method for titrating pepsin.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 790–791.

Remington, J. P.: An international pharmacopœial bureau.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 514–518.

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Wilbert, M. I.: Pharmacopœial titles for new remedies. A compilation showing the titles included in several of the foreign pharmacopœias.—J. Am. Pharm. Assoc. 1914, v. 3, p. 652–655.

Dichgans, H.: A comparative examination of the pharmacopœial methods of assay for active drugs and their preparations. An experimental basis for international uniformity.—Apoth.-Ztg. 1914, v. 29, p. 283, 293, 306, 319, 330, 342, 356, 368, 378, 391, 403, 414, 441, 462, 487, 498, 516, 519.

2. ADOPTION OF BRUSSELS CONFERENCE PROTOCOL.

Anon.: A detailed report of the proceedings of the International Conference for the Unification of Formula of Active Medicaments held in Brussels September 15–20, 1902.—Rev. Internat. pharm. Brux. 1914, v. 2, p. 73, 81, 101, 117, 129, 149, 161, 178, 193.

Editorial: The adoption of the international agreement by the Ph. Brit. V has necessitated certain changes in the preparation, composition, and strength of important galenical compounds containing potent ingredients, with the object of providing uniformity in the pharmacopœial usage of the different countries.—Pharm. J. 1914, v. 93, p. 447. See also Brit. M. J. 1914, v. 2, p. 635; Chem. & Drug. 1914, v. 85, p. 480; and Am. Druggist, 1914, v. 62, p. 403.

Wilbert, M. I.: The provisions of the Brussels Conference Protocol have generally been followed in the new Ph. Brit. V, special attention being directed to the exceptions made. The proposed international drop counter is recognized, the dropping device being described.—Am. J. Pharm. 1914, v. 86, p. 559.

Anon.: A table in the Ph. Brit. V sets out in detail the deviations from the international agreement respecting the unification of the pharmaceutical formulas for potent drugs which was signed at Brussels on November 26, 1906.—Chem. & Drug. 1914, v. 85, p. 486.

Editorial: The Ph. Norv. IV embodies the requirements of the Brussels Conference in tabular form and articles corresponding to those that have been included in the Pharmacopœia are designated by the addition of the letters "P. I." to the subtitle.—Bull. Pharm. 1914, v. 28, p. 136.

8. DROPS AND DROPPERS.

Heebner, Chas. F.: In the Ph. Brit. V descriptions of analytical processes the term "drop" is often used, and hence an official medicine dropper has been adopted, in accordance with the international agreement, having its delivery end 3 millimeters in external diameter and adapted to deliver 20 drops of distilled water to the gram (milliliter) at 15.5°. It should be noted that all the temperatures mentioned throughout the book are degrees centigrade, though there

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is no reference to the fact.—Canadian Pharm. J. 1914, v. 48, p. 206. See also Anon.: Chem. & Drug. 1914, v. 85, p. 484.

Anon.: An illustrated description of a dropper device and container for eyewash.—Pharm. Post, 1914, v. 47, p. 258. See also Apoth.-Ztg. 1914, v. 29, p. 756; and Pharm. Zentralh. 1914, v. 55, p. 301.

Anon.: An illustrated description of a dropping bottle with a locking device for the stopper.—Pharm. Zentralh. 1914, v. 55, p. 259. See also Am. Druggist, 1914, v. 62, p. 57.

Anon.: A review of several recent articles on the value of drop tables and the use of the international standard dropper.—Pharm. Zentralh. 1914, v. 55, p. 374.

Wright, Eugene: The measurement of the refractive index of a drop of liquid.—J. Washington Acad. 1914, v. 4, p. 269–279.

Vaillant, P.: On the law of Tate and the variation in the size of drops under the influence of the rate of flow.—Compt. rend Acad. sc. 1914, v. 158, p. 936–938.

a. FOREIGN PHARMACOPŒIAS.

1. BRITISH.

The British Pharmacopœia, 1914, published under the direction of the General Council of Medical Education and Registration of the United Kingdom, is the fifth edition of this book. It contains a total of XXXI and 602 pages and officializes 817 drugs and preparations. The monographs, descriptions, and formulas occupy 452 pages, the several appendices 92 pages, and the index 47 pages. The official articles include a total of 171 vegetable drugs, 14 animal drugs, 206 chemical drugs, and 426 galenical preparations. The additions in the 1914 pharmacopœia number 43 and the deletions 168.

The book was formally adopted by the executive committee of the General Medical Council on July 13, 1914, was placed on exhibition for review in London on October 1, and was available through the book trade on December 31 of the same year.

Among the novel features of the Ph. Brit. V is a list of abbreviated Latin names of official drugs and preparations adopted in the index of the British Pharmacopœia. This list is presented separately in the form of an appendix and the abbreviations given are intended to comply with the abbreviations to be included in the forthcoming edition of the Pharmacopœia of the United States.

The metric system of weights and measures has been employed for all pharmaceutical and analytical computations. As a transitional provision, doses are also expressed in terms of the imperial system. The term "mil" is recognized as a short official designation for the

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milliliter, "decimil" for the tenth part of a milliliter, and "centimil" for the one-hundredth part of a milliliter.

In accordance with the international agreement of 1906, a dropper having an external diameter of exactly 3 millimeters is to be employed when drops are directed to be used in the several analytical processes.

The tests for identity and purity have been much elaborated, the physical and chemical constants being described at some length. In connection with the volatile oils the optical rotation is usually given and in connection with fats and the fatty oils the saponification number and the iodine number are generally specified. The number of assay processes for botanical drugs, galenical preparations, and volatile oils has been increased considerably, and the book now includes 13 assays for crude drugs, of which 7 are for alkaloids, 25 assays for galenical preparations, and 11 for volatile oils.

This pharmacopœia also indicates a limit to the proportion of lead or of arsenic permissibly present as an impurity in many pharmacopœial substances. These limits are noted in the text, and general methods for determining the contaminations are included among the appendices. The same practice has been adopted with respect to many of the other methods for detecting chemical and physical constants. General processes are included for iodine value and unsaponifiable matter in fixed oils or fats and the determination of esters and of alcohols in volatile oils. This pharmacopœia also describes official methods for the determination of melting points, boiling points, refractive indices, optical rotation, and specific gravity.

The provisions of the International Conference respecting the unification of the formulas for potent drugs and preparations have been generally adhered to. A table showing the deviations from the recommendations of the international agreement of September, 1906, has been introduced with the introductory paragraphs of the book. The British practice of measuring liquids by volume and solids by weight has been maintained throughout, being thought more convenient both to the prescriber and the dispenser than the continental practice of weighing liquids as well as solids.

Of the crude drugs official in the pharmacopœia of 1908, or in the Indian and Colonial Addendum, no fewer than 51 have been deleted and of the galenical preparations 98 have been omitted. These include 3 aceta, 3 decocta, 7 emplastra, 6 extracta and 9 extracta liquida, 8 infusa, and 16 liquores concentrati.

Of the 43 articles added to the Ph. Brit. V, 3 are crude drugs, 25 are chemicals, 14 are galenical preparations, and 1 is a fat.

The new British Pharmacopœia has been liberally discussed by the medical as well as the pharmaceutical press of that country. Con-

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siderable space has been devoted in the several journals to the changes which have occurred in the revision. Lists are given of the additions and omissions.

Gadd, H. Wippell: Some first impressions of the Ph. Brit. V. Even a cursory glance through the pages of the new pharmacopœia has a chilling effect.—Pharm. J. 1914, v. 93, p. 494.

Editorial: The British Pharmacopœia, 1914. When judged as an imperial as distinguished from a national pharmacopœia the new work does not appear to merit any unfavorable criticism. The needs of different parts of the Empire appear to have been met in a reasonable manner, but this matter can not perhaps be altogether accurately judged from the point of view of medicine in the mother country alone, and experience will show whether further modifications and additions may be necessary to make the book truly fulfill its world-wide functions.—Brit. M. J. 1914, v. 2, p. 884–885.

Editorial: The new pharmacopœia. An abstract of an article published in the London Times.—Chem. & Drug. 1914, v. 84, p. 871–872.

Anon.: Notes on the history of the British Pharmacopœia, and portraits of the members of the General Medical Council committee.—Chem. & Drug. 1914, v. 85, p. 140–142.

Anon.: The British Pharmacopœia, 1914, from the pharmaceutical point of view.—Lancet, 1914, v. 187, p. 907–908.

Editorial: Discussion of the publication of the new British Pharmacopœia by the General Medical Council.—Pharm. J. 1914, v. 93, p. 418.

Anon.: The chemistry of the British Pharmacopœia, 1914.—Pharm. J. 1914, v. 93, p. 495, 520, 554, 585, 617, 664, 669, 729.

Anon.: A review of the galenical preparations of the British Pharmacopœia, with formulas and processes.—Pharm. J. 1914, v. 93, p. 492, 522, 555, 586.

Anon.: The formulas of the Ph. Brit. V in equivalent imperial weights and measures.—Pharm. J. 1914, v. 93, p. 760–761, 806–807, 840–841, 874–875.

Additional comments on the Ph. Brit. V will be found in Brit. M. J. 1914, v. 2, p. 634–635, 672–673, 719–721, 758–760, 797–798; Lancet, 1914, v. 187, p. 901–902; Prescriber, 1914, v. 8, p. 295–297; Practitioner, 1914, v. 93, p. 853–855; Chem. & Drug. 1914, v. 85, p. 483ff; Pharm. J. 1914, v. 93, p. 452–455; Brit. & Col. Drug. 1914, v. 66, p. 245–250, 300–302; New York M. J. 1914, v. 100, p. 829; Am. Druggist, 1914, v. 62, p. 403–404, 432; Drug. Circ. 1914, v. 57, p. 690; Am. J. Pharm. 1914, v. 86, p. 559–562; Merck's Rep. 1914, v. 23, p. 284; Pharm. Era, 1914, v. 47, p. 513; Midl. Drug. 1914, v. 48, p. 524; Canadian Pharm. J. 1914, v. 48, p. 203–206; Canadian Drug. 1914, v. 26, p. 634; Chem. & Drug. Australas. 1914, v. 24, p. 416–417,

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429–430; Pharm. Weekblad, 1914, v. 51, p. 1282–1283; Schweiz. Apoth.-Ztg. 1914, v. 52, p. 703–705; Pharm. Post, 1914, v. 47, p. 800–801; Apoth.-Ztg. 1914, v. 29, p. 859.

BRITISH PHARMACEUTICAL CODEX.

Editorial Note: B. P. Codex revision is to be taken in hand with a view to the production, in due course, of a further issue of the work, but this must not be held to imply that there is any immediate need of a new codex.—Pharm. J. 1914, v. 92, p. 781.

Editorial: The British Pharmaceutical Codex is a supplementary standard in New South Wales and Tasmania, and "Squire's Companion" in western Australia.—Chem. & Drug. Australas. 1914, v. 29, p. 238.

News Note: The codex is not adopted as a supplementary standard in New Zealand.—Chem. & Drug. Australas. 1914, v. 29, p. 104.

"Karshish": The codex is the nearest approach we have at present to the suggested national health insurance pharmacopœia and it could well be adapted for the purpose.—Pharm. J. 1914, v. 93, p. 11.

Anon.: The hope is expressed that the British Pharmaceutical Codex may be printed on India paper in a compact form, so that every panel doctor may be able to carry a copy in his pocket.—Pharm. J. 1914, v. 92, p. 318.

Editorial: It is evident that there is a demand for local formularies. It is to be regretted that such a small modicum of care and skill has sometimes been utilized in their preparation.—Pharm. J. 1914, v. 93, p. 550.

Watters, Henry: An appeal to the druggists of Canada for suggestions for the improvement of Canadian Formulary.—Canadian Pharm. J. 1914, v. 48, p. 197–198. See also Editorial, p. 194.

2. FINNISH.

Lundin, P. E.: A review of the new Finnish Pharmacopœia. This book is published both in Swedish and Finnish and succeeds the fourth edition of the Finnish Pharmacopœia which was published in 1885. It includes xli+349 pages; 162 new articles have been included and 137 of the formerly official articles deleted. The titles are in Latin and the subtitles and synonyms are given both in Swedish and Finnish.—Pharm. Ztg. 1914, v. 59, p. 833–834.

3. NORWEGIAN.

Rustang, Gullow: A review of the Norwegian Pharmacopœias in use before 1914.—Norges Apotek. Tidsskr. 1914, v. 22, p. 160–166.

Andresen, S.: A review of the Ph. Norv. IV with the tests and requirements including the pharmacognosy, chemistry, and galenical

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preparations of the pharmacopœia.—Apoth.-Ztg. 1914, v. 29, p. 772–773.

Editorial: The new pharmacopœia is in Norwegian, the titles being in Latin. In many respects the new edition resembles the German Pharmacopœia and it has been brought thoroughly up to date by including definite standards of purity, or of content of active principles.—Pract. Drug. 1914, v. 32, p. 34. See also Anon.: Südd. Apoth.-Ztg. 1914, v. 54, p. 78.

Editorial: In accordance with an existing agreement the Latin nomenclature of the Norwegian Pharmacopœia is in accord with that of the other Scandinavian countries, Sweden and Denmark, and is quite distinct from that of other European countries.—Bull. Pharm. 1914, v. 28, p. 136.

Anon.: A number of formulas from the Ph. Nov. IV are reprinted.—Pharm. Zentralh. 1914, v. 55, p. 322–323.

Johnsen, G.: Further comment on preparations of the Norwegian Pharmacopœia.—Norges Apotek. Tidsskr. 1914, v. 22, p. 8–12.

4. GERMAN.

Bohrisch, P.: Suggestions for improving the monographs included in the Ph. Germ. V.—Pharm. Zentralh. 1914, v. 55, p. 891, 908, 921; also Apoth.-Ztg. 1914, v. 29, p. 901–902.

Rupp, E.: The Ph. Germ. V methods for testing official preparations.—Apoth.-Ztg. 1914, v. 29, p. 722–724.

Lefeldt, M.: Suggestions for additions and amendments to the Ph. Germ. V.—Pharm. Ztg. 1914, v. 59, p. 42–43.

Freund, Hans: A contribution on the valuation of official Ph. Germ. V tinctures.—Pharm. Zentralh. 1914, v. 55, p. 261–268.

Linke, H.: Observations on the examination of official products.—Apoth.-Ztg. 1914, v. 29, p. 673–674, 683–685, 694–695.

Steinhorst, H.: The testing of official Ph. Germ. V extracts for heavy metals and the need for avoiding containers of tin and iron.—Apoth.-Ztg. 1914, v. 29, p. 39.

Feist, K.: Suggestions for improving the tests for pharmaceutical specialties.—Apoth.-Ztg. 1914, v. 29, p. 604–606.

Matute and Bascunana: The requirements of the Spanish, German, Austrian, Belgian, British, United States, French, Swiss, and Italian Pharmacopœias.—Farm. Españ. 1914, v. 46, p. 742–746. See also Nigrisoli, Vittorio: Boll. chim.-farm. 1914, v. 53, p. 401–419.

Anon.: A compilation of abstracts of articles referring to the Ph. Germ. V.—Pharm. Zentralh. 1914, v. 55, p. 536ff.

A book review calls attention to a new volume entitled "The Ph. Germ. V, Chemical and Physiological Methods of Testing," by Herzog and Hanner.—Pharm. Zentralh. 1914, v. 55, p. 211–212.

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5. RUSSIAN.

Anon.: The Russian and British Pharmacopœias compared. Presentation of a table giving the titles of identical preparations, a second table showing preparations differing in strength, and a third table showing preparations differing slightly in strength and method of preparation.—Chem. & Drug. 1914, v. 84, p. 164–166.

6. ITALIAN.

News Note: In August the committee was appointed which is to have charge of the revision of the Italian Pharmacopœia.—J. Am. M. Assoc. 1914, v. 63, p. 2300.

Nigrisoli, Vittorio: A note on the official Italian Pharmacopœia and suggestions for its revision. A number of the official articles are discussed in detail. The article also contains a table showing the comparative requirements for active substances in the Italian, Austrian, Belgian, French, German, and Swiss Pharmacopœias and a table showing the maximum dose of a number of active medicaments in the same authorities.—Boll. chim.-farm. 1914, v. 53, p. 401–419.

7. FRENCH.

Natute and Bascunana: Comparative study of the requirements of the Spanish Pharmacopœia, with a table showing the requirements of the Spanish, German, Austrian, Belgian, British, United States, French, Swiss, and Italian Pharmacopœias.—Farm. Españ. 1914, v. 46, p. 742–746. See also Nigrisoli, Vittorio: Boll. chim.-farm. 1914, v. 53, p. 401–419.

8. SWISS.

Nigrisoli, Vittorio: A table showing the comparative requirements for active substances in the Italian, Austrian, Belgian, French, German, and Swiss Pharmacopœias and a table showing the maximum dose of a number of active medicaments in the same authorities.—Boll. chim.-farm. 1914, v. 53, p. 401–419. See also Natute and Bascunana: Farm. Españ. 1914, v. 46, p. 742–746.

9. AUSTRIAN.

Helch, Hans: Propositions for the revision of the Austrian Pharmacopœia. A compilation of suggestions and criticisms.—Pharm. Post, 1914, v. 47, p. 571–573, 579–582.

Stébra-Böhm, Johann: Suggestions as to the necessary changes and additions to be included in the forthcoming Austrian Pharmacopœia.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 299.

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Fernau, Albert: A compilation of suggestions for use in connection with the revision of the Austrian Pharmacopœia.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227, 241, 254, 263, 275.

Nigrisoli, Vittorio: The requirements for active substances in the Italian, Austrian, Belgian, French, German, and Swiss Pharmacopœias.—Boll. chim.-farm. 1914, v. 53, p. 401–419. See also Natute and Bascunana: Farm, Españ. 1914, v. 46, p. 742–746.

Fernau, Albert: The Ph. Austr. VIII still contains a number of faults and shortcomings that should be eliminated in the coming revision.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 275.

News Note: Report of a proposed organization of an independent pharmacopœial commission to assist in the revision of the Austrian Pharmacopœia.—Pharm. Presse, 1914, v. 19, p. 226. See also Pharm. Post, 1914, v. 47, p. 462–463.

Stébra-Böhm, Johann: For practical reasons the publications of the Austrian Pharmacopœia in the Latin text should be discontinued and the pharmacopœia printed in the several languages now in use in the Empire.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 299.

10. JAPANESE.

Anon.: Some further alterations in the Japanese Pharmacopœia proclaimed by the home minister in ordinance. For previous revisions of the monographs see C. & D. March 2, 1912, and April 5, 1913.—Chem. & Drug. 1914, v. 84, p. 167.

11. BELGIAN.

Anon.: An enumeration of the Belgian pharmacopœias of the seventeenth century.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 161–162.

Natute and Bascunana: Comparative study of the requirements of the Spanish, German, Austrian, Belgian, British, United States, French, Swiss, and Italian Pharmacopœias.—Farm. Españ. 1914, v. 46, p. 742–746. See also Nigrisoli, Vittorio: Boll. chim.-farm. 1914, v. 53, p. 401–419.

12. DUTCH.

The second supplement to the Ph. Ndl. IV was issued under date of May 29, and like the pharmacopœia itself is available in both a Latin and a Dutch edition. The pamphlet of 25 and V printed pages is printed on one side of the sheet and includes monographs for 12 articles, 2 silver salts (colloidal silver and silver proteinate), 2 glycerophosphates (calcium and sodium), 1 morphine derivative (dionin), 2 synthetic local anesthetics (novocaine and tropacocaine hydrochloride), bismuth oxy-iodo-gallate or airol, desiccated thyroid gland, adonis vernalis herb, oil of chaulmoogra, and zinc paste.

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Several aditional reagents are also included and the monographs for 23 official articles are corrected so as to bring the requirements up to date. The maximum single and daily doses for the several active drugs are given in the index as is the solubility of the several chemical substances. Desiccated thyroid gland is required to contain 0.4 per cent of iodine when assayed by the method outlined.

Schamelhout, A.: The second supplement to the fourth edition of the Ph. Ndl. A review of the several articles that have been included.—Rev. Internat. Pharm. Brux. 1914, v. 2, p. 21–24. See also Suyver, J. F.: Pharm. Weekblad, 1914, v. 51, p. 72–86.

Anon.: A review of the second supplement to the Ph. Ndl. IV.—Pharm. Post, 1914, v. 47, p. 125–126. See also Anon.: Chem. & Drug. 1914, v. 84, p. 124.

A book review calls attention to a supplement to the fourth edition of the Netherlands Pharmocopœia, published by the Rotterdam Department of the Netherlands Association for the Advancement of Pharmacy.—Pharm. Weekblad, 1914, v. 51, p. 233–238. See also p. 129, Pharm. Zentralh. 1914, v. 55, p. 256; and Am. Perf. 1914, v. 9, p. 159.

Anon.: A number of formulas from the new supplement to the Dutch Pharmacopœia published by the Rotterdam Department of the Nederlandsche Maatschappij ter Bevordering der Pharmacie.—Chem. & Drug. 1914, v. 85, p. 143–144; also Pract. Drug. 1914, v. 32, p. 395.

13. SPANISH.

Matute and Bascunana: Comparative study of the requirements of the Spanish Pharmocopœia, with a table showing the requirements of the Spanish, German, Austrian, Belgian, British, United States, French, Swiss, and Italian Pharmacopœias.—Farm. Espan. 1914, v. 46, p. 742–746.

14. ARGENTINE.

Macmillan, H. J.: The first official edition of the Argentine Pharmacopœia was published in November, 1898, having been compiled by a committee of eight doctors appointed by the national board of health. Many formulas of the French Codex were bodily transferred. There occur among other preparations, 15 abstracts, 6 epithems, 87 fluid extracts, 7 infusions, and 46 tinctures.—Chem. & Drug. 1914, v. 84, p. 166–167.

15. SPANISH EDITION OF THE U. S. P. VIII.

Anon.: Article 31 of the regulations for the practice of pharmacy in the Republic of Cuba provides that the Spanish edition of the Pharmacopœia of the United States is to be the standard for drugs and medicines.—Farm. Españ. 1914, v. 46, p. 68.

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III. COMMENTS ON OFFICIAL ARTICLES.

ACACIA.

U. S. P. IX: Specifies other African species of acacia. The drug to be almost completely soluble in twice its weight of water. Not more than 1 per cent to be insoluble.—J. Am. Pharm. Assoc. 1914, v. 3, p. 359, and Abstr. Prop. Changes, Part 2, 1914, p. 1.

Linke, H.: The Ph. Germ. V. permits a maximum of 5 per cent of ash. The commercial drug was found to contain only from 2.2 to 2.8 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 567.

Grimme, Clemens: A contribution to our knowledge of the gums of commerce, with observations on the comparative value of the several methods of testing.—Pharm. Zentralh. 1914, v. 55, p. 237–246. See also Alland: Bull. sc. pharmacol. 1914, v. 21, p. 477–487.

Jensen, H. R.: One sample of acacia, closely simulating in appearance the hard Senegal variety, was found to be spurious, being evidently a pale sample of the semisoluble Bassora type.—Evans' An. Notes, 1914, p. 5.

Baker, W. L.: Gum Senegal was found to contain too large an amount of wood.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Maines, E. L.: Acacia was found to contain from 1.73 to 2.82 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Mann, E. W.: The ash yield for 9 samples of the entire gum acacia of various grades ranged from 2.05 to 2.61 per cent. For 18 samples of the powder, the corresponding figures were 1.84 to 3.41 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 5.

U. S. P. IX: Mucilage of acacia to be made by dissolving 350 gm. of acaccia in distilled water to make 1,000 gm.—J. Am. Pharm. Assoc. 1914, v. 3, p. 551, and Abstr. Prop. Changes, Part 3, 1914, p. 28.

Kordon, Frido: Suggestion to prepare mucilage of acacia by circulatory displacement.—Pharm. Post, 1914, v. 47, p. 318.

Williams, Ed. E.: In the manufacture of mucilage of acacia, the directions should read: "Invert bottle occasionally till solution is effected," as this dissolves the gum as quickly as constant agitation.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

U. S. P. IX: The sirup is to be heated at boiling temperature for 15 minutes, the volume restored with boiling water, and the product preserved in sterilized bottles, closed with sterilized stoppers and capped.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1575–1576, and Abstr. Prop. Changes, Part 6, 1914, p. 13–14.

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ACETANILIDUM.

Williams, Joseph H.: The manufacture of acetanilide.—Pharm. J. 1914, v. 93, p. 293. See also Haeussermann: J. Pharm. Elsass-Lothr. 1914, v. 41, p. 167–168; and Anon.: Southern Pharm. J. 1914, v. 7, p. 60.

Linke, H.: Acetanilide is more readily soluble in chloroform than in ether, the relations being 1:8 of chloroform and 1:50 of ether.—Apoth.-Ztg. 1914, v. 29, p. 489.

Stockinger, O.: Ten lots of acetanilide examined had melting points ranging from 113° to 114.5° (U. S. P. 113°), boiling points ranging from 293° to 295° (U. S. P. 299°), and answered all other U. S. P. requirements.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 127.

Mirkin, A.: On the determination of acetanilide.—Am. J. Pharm. 1914, v. 86, p. 354.

Emery, W. O.: The estimation of acetanilide and phenacetin in admixture. Outline of the method with report of some experimental results.—J. Ind. & Eng. Chem. 1914, v. 6, p. 665–669.

E'we and Vanderkleed: Volatility of caffeine and of acetanilide in a current of steam. From 2.4 to 3 per cent of the acetanilide was recovered from the distillate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1683.

Fernau, Albert: The indophenol test should be deleted as acetphenetidin gives practically the same color reaction. The bromine test is applicable to acetanilide, but not to acetphenetidin.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Kebler, L. F.: Outline of method for the determination of acetanilide in compressed tablets and in tablets containing acetanilide mixtures.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1078.

Department of Agriculture: Reports that 5 gr. acetanilide tablets were found to contain but 4.36 gr. of acetanilide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1286.

Kaiser, W. F.: Suggestion to include in the compound acetanilide powder 10 parts of ammonium carbonate in place of a corresponding amount of acetanilide.—Proc. Wisconsin Pharm. Assoc. 1914, p. 71.

Lyman, Rufus A.: Caffeine is being used with the idea of antagonizing the toxic effect of acetanilide upon the heart muscle.—Southern Pharm. J. 1914, v. 6, p. 339.

Stevenson, B. A.: From a number of experiments it would seem that acetanilide derivatives are at times eliminated in mother's milk.—J. Am. M. Assoc. 1914, v. 62, p. 1434–1435.

ACETONUM.

E'we, G. E.: Two samples of acetone examined, had specific gravities of 0.852 and 0.819 (U. S. P. O. 790), and contained excessive

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amounts of empyreumatic substances, but were otherwise U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 128.

Denigès and Simonot: The rapid determination of acetone by the chronometric method.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 11–19.

Cervello and Girgenti: The qualitative and quantitative determination of acetone, with observations on physiological acetonuria and the influence of various drugs on hunger acetonuria.—Arch. exper. Path. u. Pharmakol. 1914, v. 76, p. 118–124.

Frankforter and Cohen: Equilibria in the systems, water, acetone and inorganic salts.—J. Am. Chem. Soc. 1914, v. 36, p. 1103–1134.

Klein, Fred: Acetone and its reducing properties toward selenious acid.—Pract. Drug. 1914, v. 32, p. 538.

Hagglund, Erik: A method for the quantitative separation of acetaldehyde and acetone.—Ztschr. Anal. Chem, 1914, v. 53, p. 433–439.

Vogt, E.: The treatment of inoperable carcinoma of the uterus with acetone.—Therap. Monatsh. 1914, v. 28, p. 123–125.

For additional references on acetone see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; and J. Am. M. Assoc.

ACETPHENETIDUM.

Williams, Joseph H.: The manufacture of phenacetin.—Pharm. J. 1914, v. 93, p. 294. See also Chem. & Drug. 1914, v. 85, p. 390; and Southern Pharm. J. 1914, v. 7, p. 61.

Wilbert, M. I.: Phenacetinum is recognized as a title for acetphenetidinum in all of the European pharmacopœias.—J. Am. Pharm. Assoc, 1914, v. 3, p. 654.

Emery, W. O.: Estimation of acetanilide and phenacetin in admixture. Outline of the method, with report of some experimental results.—J. Ind. & Eng. Chem. 1914, v. 6, p. 665–669.

Kebler, L. F.: Outline of method for the determination of acetphenetidin in compressed tablets and in compound tablets containing acetphenetidin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1084.

ACIDUM ACETICUM.

Klason, Peter: An attempt at a theory of the dry distillation of wood.—J. Prakt. Chem. 1914, v. 90, p. 413–447.

Anon.: Manufacture of acetic acid. English Patent 10377, April 27, 1914.—J. Soc. Chem. Ind. 1914, v. 33, p. 961. See also French, E. H., p. 961; and Behrens, J., p. 807.

Bertrand and Sazerac: Observations on the favorable action exercised by manganese on acetic fermentation.—Bull. sc. pharmacol. 1914, v. 21, p. 321–324.

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Fernau, Albert: For concentrated acetic acid, tests for formic acid and sulphurous acid should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Orrick, W. H.: Twelve lots of acetic acid tested 35.9 to 37.3 per cent absolute acetic acid.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 127.

Roberts, J. G.: Of four samples of acetic acid of various grades examined, one, which was supposed to be 36 per cent acetic acid, contained only 0.64 per cent absolute acetic acid.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 127.

Brown, L. A.: Two samples of dilute acetic acid analyzed; one passed and one adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 117.

Yanagisawa, H.: The utilization of the higher fatty acids occurring in the manufacture of acetic acid and sodium acetate from calcium pyrolignate.—J. Pharm. Soc. Japan, 1914, January, p. 1.

For additional references on acetic acid see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

ACIDUM ACETICUM DILUTUM.

Ziefle, Adolph: Of 71 samples of diluted acetic acid examined, 36 were not within 10 per cent of official strength.—Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 155–156.

ACIDUM ACETICUM GLACIALE.

Mann, E. W.: We have experienced considerable difficulty in obtaining supplies of glacial acetic acid of sufficiently high melting point. The maximum figure observed was 16.58°, but the majority of samples examined melted between 13° and 14.5°.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 42.

E'we, G. E.: Of 12 lots of glacial acetic acid examined, only 1 tested less than the required 99 per cent, this sample testing 98.7 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 128.

Hill, C. A.: Of 123 samples of glacial acetic acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 4 parts per million. None of the samples contained arsenic.—Chem. & Drug. 1914, v. 85, p. 20.

ACID, ACETYLSALICYLIC.

Gehe & Co.: The consumption of acetylsalicylic acid is steadily increasing.—Handelsbericht, 1914, p. 121.

Williams, Joseph H.: Acid acetylsalicylic, known also under the trade name "aspirin," is prepared by acting on salicylic acid with either acetyl chloride or acetic anhydride and recrystallizing from

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alcohol.—Pharm. J. 1914, v. 93, p. 293. See also Chem. & Drug. 1914, v. 85, p. 313; and Southern Pharm. J. 1914, v. 7, p. 58.

Gerngross and Kast: Preparing salts of acetylsalicylic acid. English Patent 18,743, Aug. 18, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 613.

Bruun, H.: Aspirin and acetylsalicylic acid.—Norges Apotek. Tidskr. 1914, v. 22, p. 107. See also Størmer, G., p. 128, and Anon., p. 336.

Remington, J. P.: The Pharmacopœia will probably include aspirin, if the manufacturer will sign a contract to relieve the pharmacopœial commission from the results of lawsuits.—Proc. West Virginia Pharm. Assoc. 1914, p. 89.

Anon: Acidum acetylsalicylicum, a new addition to the Ph. Brit. V. Brand names for this are aspirin, salacetin, saletin, and xaxa.—Chem. & Drug. 1914, v. 85, p. 486. See also Pharm. J. 1914, v. 93, p. 346.

Lefeldt, M.: The Ph. Germ. V requirement that acetylsalicylic acid be odorless is too stringent. A faint odor of acetic acid is usually present.—Pharm. Ztg. 1914, v. 59, p. 42.

Anon.: The Japanese Pharmacopœia now gives the melting point of acetylsalicylic acid as about 135°.—Chem. & Drug. 1914, v. 84, p. 167.

E'we and Vanderkleed: Aspirin can not be put through the processes necessary in making compressed tablets without slight decomposition resulting in the liberation of salicylic acid. Examination of 13 commercial samples of 5-grain tablets showed ratios of free salicylic acid to aspirin ranging from 1:136 to 1:1568.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 276.

News Item: Nine samples of aspirin examined by the division of foods and drugs of the New Jersey State Board of Health were all below standard.—J. Am. M. Assoc. 1914, v. 62, p. 859.

Lythgoe, Hermann C.: Five samples of 5-grain aspirin tablets were obtained and examined. They were found to contain from 4.16 to 5 grains per tablet. The melting point of the aspirin obtained was found to vary from 124.5° to 129.5°; the melting point of pure aspirin is 135°.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 407.

Table showing some of the analytical results reported for aspirin tablets.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, L. A.	22	12	Proc. Kentucky Pharm. Assoc. 1914, p. 116.
Congdon, Leon A.	16	12	Rep. Kansas Bd. Health, 1914, p. 100.
Sayre, L. E.	4	3	Bull. Kansas Bd. Health, 1914, v. 10, p. 178.
Strode, Sylvanus E.	2	1	Rep. Ohio D. & F. Div., 1914, p. 118.
Todd, A. R.	11	4	Bull. Michigan D. & F. Dept., 1914, January-February, p. 17.
Todd, A. R.	24	4	Rep. Michigan D. & F. Com. 1914, p. 176.

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Anon.: Hexamethylenamine (urotropine) and acetylsalicylic acid (aspirin) are chemically incompatible in solution, the hexamethylenamine decomposing to yield ammonia and formaldehyde.—J. Am. M. Assoc. 1914, v. 63, p. 1971.

Anon.: Antipyrine and aspirin should not be mixed together. The acetic ester will be split off and keep the powder moist.—Am. Druggist, 1914, v. 62, p. 93.

Scoville, W. L.: The incompatibility of quinine sulphate and aspirin is probably due to the fact that quinine is changed by organic acids into an isomeric poisonous body known as quinotoxin.—Bull. Pharm. 1914, v. 28, p. 527.

Gerngross and Kersasp: Observations on the salts of acetylsalicylic acid.—Am. Chem. 1914, v. 406, p. 241–260.

Anon.: Properties of salts of acetylsalicylic acid, particularly the acetylsalicylates of sodium, potassium, lithium, magnesium, calcium, zinc, and mercury.—Südd. Apoth.-Ztg. 1914, v. 54, p. 624.

van Itallie and Olivier: The chemistry of calcium acetylsalicylate.—Pharm. Weekblad, 1914, v. 51, p. 1361–1366. See also Apoth.-Ztg. 1914, v. 29, p. 939.

Reed, Edward N.: Report of a case of idiosyncrasy to aspirin (acetylsalicylic acid) in which vomiting, cyanosis, and edema followed the ingestion of 5 grains of the drug. No treatment was instituted, and in about six hours the patient was comfortable.—J. Am. M. Assoc. 1914, v. 62, p. 773. See also p. 797.

For additional reference on acetylsalicylic acid see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

ACIDUM BENZOICUM.

Williams, Joseph H.: The manufacture of benzoic acid.—Pharm. J. 1914, v. 93, p. 293. See also Southern Pharm. J. 1914, v. 7, p. 60.

Wende, E.: A simple method for the determination of halogens in benzoic acid.—Apoth.-Ztg. 1914, v. 29, p. 157.

Rupp, E.: The Ph. Germ. method for testing benzoic acid is time consuming and unsatisfactory. A modified halogen test is outlined.—Südd. Apoth.-Ztg. 1914, v. 54, p. 302; also Apoth.-Ztg. 1914, v. 29, p. 723.

Blanksma, J. J.: Observations on some halogen derivatives of benzoic acid.—Chem. Weekblad, 1914, v. 11, p. 59–61.

Serger, H.: A review of some of the recent literature relating to the use of benzoic acid as a chemical preservative.—Chem.-Ztg. 1914, v. 38, p. 245–246.

For additional comments on benzoic acid see Zentralbl. Biochem. Biophys.; Chem. Abstr.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

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ACIDUM BORICUM.

Burger, A.: U. S. Patent 1,108,120. Boric acid. Boric acid is produced by calcining a borate and heating the resulting products with carbon dioxide in the presence of water.—J. Ind. & Eng. Chem. 1914, v. 6, p. 1050; also J. Soc. Chem. Ind. 1914, v. 33, p. 1008.

Dhar, Nilratan: Observations on several complex acids of boron.—Ztschr. anorg. Chem. 1914, v. 86, p. 196–200.

E'we, G. E.: One lot of boric acid examined was below the U. S. P. requirement of 99.8 per cent, testing 99.4 per cent, and contained a slight excess of magnesium and sulphates, but was U. S. P. in other respects.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 131.

Mann, E. W.: For 30 samples of boric acid, 3 parts per million was the highest figure recorded for arsenic, the majority being practically free from this impurity.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 44.

Hill, C. A.: Of 1,524 samples of boric acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 60 parts per million. The arsenic content varied from 0 to 40 parts per million.—Chem. & Drug. 1914, v. 85, p. 19.

Firth and Myers: Some properties of solutions of the boric acids in alcohol. A modified boiling point apparatus.—Proc. Chem. Soc. 1914, v. 30, p. 293.

Faber, Theodore: The determination of boric acid in ointments.—Pharm. Ztg. 1914, v. 59, p. 163–164. See also Enz, Karl, p. 313.

Bertrand and Agulhon: A method for the determination of minute quantities of boric acid in organic matter.—Bull. sc. pharmacol. 1914, v. 21, p. 65–68; also Ann. Falsif. 1914, v. 7, p. 67–69, 119–121.

Bertrand and Agulhon: The rapid determination of boric acid occurring naturally and introduced in food materials.—Compt. rend. Acad. sc. 1914, v. 158, p. 201–204; also Bull. Soc. chim. France, 1914, v. 15, p. 292–295, and Bull. sc. pharmacol. 1914, v. 21, p. 68–71.

Jay: A method for the determination of boric acid in foods.—Compt. rend. Acad. sc. 1914, v. 158, p. 357–358.

Harris, H. L.: A contribution on the use of food preservatives. Borax and boric acid are permitted in England and Australia, but not in the United States.—Am. Med. 1914, v. 20, p. 68. See also Serger, H.: Chem.-Ztg. 1914, v. 38, p. 244–245.

ACIDUM CITRICUM.

U. S. P. IX: Melting point omitted. Tests for oxalic acid, tartaric acid and lead added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1563, and Abstr. Prop. Changes, Part 6, 1914, p. 1.

Häussler, E. P.: A new color reaction for citric acid.—Chem.-Ztg. 1914, v. 38, p. 937; also Südd. Apoth.-Ztg. 1914, v. 54, p. 514.

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Fernau, Albert: The Ph. Austr. VIII test for tartaric acid in citric acid might be elaborated on.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Roberts, J. G.: One sample of citric acid examined was found to be grossly adulterated, as it was composed largely of tartaric acid.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

E'we, G. E.: One lot of citric acid examined assayed 99.9 per cent U. S. P. citric acid, contained 8.13 per cent water of crystallization, melted when anhydrous, at 150° (U. S. P. 152° to 153°), and answered all other U. S. P. requirements.—Proc. Pennsylvania Pharm. Assoc. 1914, v. 134.

Mann, E. W.: The good record we have lately reported for citric acid has been marred by the occurrence of a sample containing no less than 75 parts per million of lead. In 45 other samples, the amount of lead found did not exceed 9 parts per million, and the maximum figure for arsenic was 2 parts per million. Ash in no case exceeded 0.06 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 44.

Hill, C. A.: Of 257 samples of citric acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 20 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 20.

Kebler, L. F.: Outline of method for the determination of citric acid in compound tablets containing acetanilide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1082.

ACID, DIETHYLBARBITURIC.

Williams, Joseph H.: Malourea is also known under the trade name of veronal, and is produced by the condensation of ethyl diethylmalonate with urea.—Pharm. J. 1914, v. 93, p. 293. See also Chem. & Drug. 1914, v. 85, p. 487; and Southern Pharm. J. 1914, v. 7, p. 60.

Heebner, Chas. F.: In Barbitone, the pharmacist will find diethyl barbituric acid, otherwise designated as veronal.—Canadian Pharm. J. 1914, v. 48, p. 204. See also Am. Druggist, 1914, v. 62, p. 404.

Jensen, H. R.: The one sample of malourea examined melted at 186°.—Evans' An. Notes, 1914, p. 44.

Kebler, L. F.: Outline of method for the determination of veronal in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1099.

Lucas, H.: A chemical study of and some new tests for veronal.—Pharm. J. 1914, v. 94, p. 424.

Biltz, Heinrich: Salts of barbituric acid and their derivatives.—Ann Chem. 1914, v. 404, p. 186–199.

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Venturoli, Guiseppe: A case of veronal poisoning, and a report of experiments on the quantitive determination of veronal in the animal body.—Apoth.-Ztg. 1914, v. 29, p. 250.

Munro, J. M. H.: Veronal poisoning. Case of recovery from 125 grains, with detailed summary of pulse and temperature observations in the form of a table.—Brit. M. J. 1914, v. 1, p. 854–856. See also Souper, H. R., p. 1015.

Russell and Parker: Fatal case of veronal poisoning, with report of the chemical procedures employed in the search for veronal.—Brit. M. J. 1914, v. 1, p. 853–854.

Fraser, Margaret H.: Note on two cases of veronal poisoning. Veronal in large doses will cause necrosis of the kidney cells. It is possible that repeated small doses may also affect the renal epithelium.—Lancet, 1914, v. 186, p. 1736–1737.

Glaser, T.: A summary from the literature of nine cases of chronic veronal poisoning, with the addition of a tenth case to the list.—(Wiener klin. Wchnschr. v. 27, Oct. 29, No. 44.) J. Am. M. Assoc. 1914, v. 63, p. 2168.

von der Porten, Ernst: The treatment of delirium tremens with veronal.—Münch. med. Wchnschr. 1914, v. 61, p. 1179. See also Schneider, Kurt, p. 1343.

Anderson, W. K.: In the treatment of a case of morphinomania, veronal in 10 grain doses gave the patient most satisfaction.—Practitioner, 1914, v. 92, p. 441.

Editorial: It seems to be unquestionably a fact that some persons develop a tolerance to veronal, but this tolerance is never as great as with morphine or cocaine.—Therap. Gaz. 1914, v. 38, p. 100.

Anon.: Suggestion to combine veronal with emetic doses of ipecac to avoid the ingestion of toxic quantities.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 477.

For additional cases of veronal poisoning see Brit. M. J.; Pharm. J.; Index Med.

ACID, FORMIC.

Haber, Fritz: The manufacture of formic and oxalic acids.—J. Ind. & Eng. Chem. 1914, v. 6, p. 328.

Bredig and Carter: The catalytic synthesis of formic acid under pressure.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 541–545.

Chattaway, F. D.: Interaction of glycerol and oxalic acid.—J. Chem. Soc. Lond. 1914, v. 105, p. 151–156.

Hottenroth, Valentine: The determination of formic acid.—Chem.-Ztg. 1914, v. 38, p. 598.

Serger, H.: Review of some of the recent literature relating to the use of formic acid as a chemical preservative.—Chem.-Ztg. 1914, v. 38, p. 210–211.

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Ewins, A. J.: The mutual solubility of formic acid and benzene, and the system, benzene-formic acid-water.—J. Chem. Soc. Lond. 1914, v. 105, p. 350–364.

For additional references on formic acid see Chem. Abstr.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.; Chem. Zentralbl.

ACIDUM GALLICUM.

Schwenk, Erw.: A contribution on gallic acid; the production of intermediate products.—J. Prakt. Chem. 1914, v. 90, p. 53–60.

Roberts, J. G.: Of the three samples of gallic acid examined, one sample yielded 0.072 per cent of residue upon ignition. One sample of technical quality yielded 0.51 per cent of residue upon ignition.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 139.

ACIDUM GLYCEROPHOSPHORICUM.

Dubois, Gaston: The chemistry and properties of glycerophosphates (glycerinophosphates).—J. Ind. & Eng. Chem. 1914, v. 6, p. 122–128.

King and Pyman: The constitution of the glycerylphosphates. The synthesis of alpha and beta-glycerylphosphates.—J. Chem. Soc. Lond. 1914, v. 105, p. 1238–1259.

Umney and Bennett: The composition of the glycerophosphates of commerce.—Pharm. J. 1914, v. 92, p. 134–135; also Chem. & Drug. 1914, v. 85, p. 165–166.

François and Boismenu: The determination of glycerophasphates in granules.—Ann. Falsif. 1914, v. 7, p. 423–432; also J. pharm. et chim. 1914, v. 10, p. 5–14, 51–57.

ACIDUM HYDRIODICUM DILUTUM.

U. S. P. IX: Rubric to read not less than 9.5 per cent nor more than 10.5 per cent. Test for chloride added. Residue changed to 3 per cent on evaporation and ignition at low red heat.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

Jensen, H. R.: A sample of hydriodic acid with specific gravity 1.1225, prepared by the action of H_2S on iodine and water, was found by Volhard's silver method to contain 15 per cent HI (which figure was known to be correct), whereas with N/I NaOH (methyl orange), a strength of 20 per cent was indicated. This discrepancy of total and haloid acidity may have been due to some complex sulphur acid.—Evans' An. Notes, 1914, p. 37.

Strachan and Chu: The transference number, conductance, and ionization of hydriodic acid at 25°.—J. Am. Chem. Soc. 1914, v. 36, p. 810–819.

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ACIDUM HYDROBROMICUM DILUTUM.

U. S. P. IX: Rubric to read not less than 9.5 nor more than 10.5 per cent. Residue on evaporation not more than 0.0025 gm. from 25 cc. Method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

Hill, C. A.: Of 42 samples of diluted hydrobromic acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 12 parts per million. The arsenic content varied from 0 to 5 parts per million.—Chem. & Drug. 1914, v. 85, p. 20.

ACIDUM HYDROCHLORICUM.

U. S. P. IX: Rubric to read not less than 31 per cent nor more than 33 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

Nield, J. H.: Process of producing hydrochloric acid. U. S. Patent 1,102,539, July 7, 1914.—J. Soc. Chem. Ind. 1914, v. 33, p. 864. See also p. 255.

Reusch, K.: A review of recent literature relating to the manufacture of sulphates and of hydrochloric acid.—Chem.-Ztg. 1914, v. 38, p. 463–464.

Orrick, W. H.: Four of the eight samples of hydrochloric acid examined were a trifle lower than the U. S. P. standard of 31.9 per cent HCl. These four samples ranged from 31.3 to 31.7 per cent. The other four samples ranged from 32.1 to 32.5 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 140.

Roberts, J. G.: The hydrochloric acid content of the samples examined ranged from 36.8 to 37.54 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 140.

Tarbell, R. F.: The determination of arsenic in hydrochloric and sulphuric acids.—J. Ind. & Eng. Chem. 1914, v. 6, p. 400–401. See also Koelsch, H.: Chem.-Ztg. 1914, v. 38, p. 5–6.

Jensen, H. R.: Thirty-four samples of pure acid, with specific gravity 1.16 to 1.17, examined in the last three years, have all contained arsenic only to the extent of 1 part per million or less.—Evans' An. Notes, 1914, p. 37.

Hill, C. A.: Of 60 samples of hydrochloric acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 5 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 20.

Andrews, Launcelot W.: A method for the precise standardization of hydrochloric acid solutions.—J. Am. Chem. Soc. 1914, v. 36, p. 2089–2091; also Chem. News, 1914, v. 110, p. 94–95.

For additional references on hydrochloric acid see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

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ACIDUM HYDROCHLORICUM DILUTUM.

U. S. P. IX: Rubric to read not less than 9.5 per cent nor more than 10.5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

Lynch, L. R.: In connection with the examination of diluted hydrochloric acid, inquiry disclosed the fact that some druggists were not aware of the strength of the concentrated acid used, and in most instances measures were used instead of weights.—Rep. District of Columbia Health Off. 1913, Washington, 1914, p. 94.

Table showing some of the analytical results reported for diluted hydrochloric acid.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, L. A.	5	3	Proc. Kentucky Pharm. Assoc. 1914, p. 117.
Frary, Guy G.	16	12	Rep. South Dakota F. & D. Div., 1914, p. 227, 232.
Lynch, R. L.	50	24	Rep. District of Columbia Health Off., 1913, Washington, 1914, p. 90.
Ziefle, Adolph	84	59	Rep. North Dakota Agric. Exper. Sta., 1912, p. 154–155.

ACIDUM HYDROCYANICUM DILUTUM.

Lundell and Bridgman: A new method for the determination of hydrocyanic acid and the alkali cyanides.—J. Ind. & Eng. Chem. 1914, v. 6, p. 554–556; also Chem. News, 1914, v. 110, p. 158–160.

Stockinger, R.: One lot assayed 2.09 per cent and was otherwise strictly U. S. P. Ten other lots ranged from 2.12 to 2.58 per cent, absolute HCN.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 140.

Wester, D. H.: Observations on the hydrocyanic acid content of folia laurocerasi.—Pharm. Weekblad, 1914, v. 51, p. 207–208.

Collins and Blair: The rate of liberation of hydrocyanic acid from linseed.—Analyst, 1914, v. 39, p. 70–74.

Sargeant and Edwards: Hydrocyanic acid gas and its uses in horticulture.—Pharm. J. 1914, v. 92, p. 193–194.

ACIDUM HYPOPHOSPHOROSUM.

U. S. P. IX: Rubric to read not less than 30 per cent nor more than 32 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, part 6, 1914, p. 2.

E'we, G. E.: Three samples of 30 per cent hypophosphorous acid examined ranged from 30.4 to 30.7 per cent absolute hypophosphorous acid, but one sample contained 1.42 per cent of calcium calculated as calcium hypophosphite.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 141.

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Wycokff, E. E.: The manufacture and assay of hypophosphorous acid.—J. Am. Pharm. Assoc. 1914, v. 3, p. 182–185.

Jensen, H. R.: One sample of hypophosphorous acid was rejected owing to the presence of a decided trace of calcium, probably as phosphate. This was precipitated by ammonia.—Evans's An. Notes, 1914, p. 38.

ACIDUM HYPOPHOSPHOROSUM DILUTUM.

U. S. P. IX: Rubric to read not less than 9.5 per cent nor more than 10.5 per cent. Test for arsenic modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 9, 1914, p. 2.

E'we, G. E.: Six samples of diluted hypophosphorous acid ranged from 10.8 to 11.6 per cent.—Proc. Pennsylvania Pharm. 1914, p. 141.

ACIDUM LACTICUM.

Oppenheimer, Max: Experimental observations on the formation of lactic acid in alcoholic fermentation.—Ztschr. physiol. Chem. 1914, v. 89, p. 45–62. See also v. 93, p. 262–269.

Freudenberg, Karl: On the configuration of glycerinic acid and of lactic acid.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2027–2037.

Fernau, Albert: A test for glycerin, by extracting the zinc salt with absolute alcohol, might be included in the Ph. Austr. for lactic acid.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Roberts, J. G.: The U. S. P. method for the determination of the strength of lactic acid is likely to give misleading results, due to the fact that the U. S. P. directs that the titration be conducted at boiling temperature, without giving the length of time during which it should be boiled.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 144.

E'we, G. E.: All 22 lots of lactic acid examined ranged between 87.3 and 92.1 per cent lactic acid, by modified method, which included the anhydride present.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 144.

Hill, C. A.: Of 18 samples of lactic acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 12 parts per million. The arsenic content varied from 0 to 0.8 parts per million.—Chem. & Drug. 1914, v. 85, p. 20.

Serger, H.: Review of some of the recent literature relating to the use of lactic acid as a chemical preservative.—Chem.-Ztg. 1914, v. 38, p. 211.

ACIDUM NITRICUM.

U. S. P. IX: Rubric to read not less than 67 per cent nor more than 69 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

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Haber, Fritz: The fixation of nitrogen and process for oxidation of nitrogen.—J. Ind. & Eng. Chem. 1914, v. 6, p. 328–330.

Tiede and Domcke: A contribution on the properties of active nitrogen.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 420–425.

Koenig and Elöd: Contribution on the question of nitrogen oxidation by electrical discharges, and the activating of nitrogen and of oxygen in a continuous electrical current.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 523–529.

Baker and Strutt: Observations on the active modification of nitrogen.—Ber. deutsch. Chem. Gesellsch. 1914, v. 47, p. 801–804, 1049–1055.

Wagner, T. B.: Synthetic production of nitric acid.—J. Ind. & Eng. Chem. 1914, v. 6, p. 75. See also Anon.: Pharm. Zentralh. 1914, v. 55, p. 5.

Reusch, K.: A review of recent literature relating to the manufacture of nitric acid.—Chem.-Ztg. 1914, v. 38, p. 464.

Grosh, Daniel M.: Popular review of the progress made in the fixation of nitrogen.—Merck's Rep. 1914, v. 23, p. 272–273.

Jones, G. Cecil: Utilization of atmospheric nitrogen; a review.—Chem. Tr. J. 1914, v. 54, p. 60–62.

For patents relating to the manufacture of nitric acid see J. Soc. Chem. Ind. 1914, v. 33, p. 200, 201, 311, 353, 421, 482, 549.

Busvold, N.: The determination of nitrogen in Norwegian saltpeter.—Chem.-Ztg. 1914, v. 38, p. 799–800.

E'we, G. E.: Of eight lots of nitric acid examined, only one tested below the required 68 per cent. This lot tested 65.6, while the others ranged from 68 to 69.1 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Hill, C. A.: Of 34 samples of nitric acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 6 parts per million. The arsenic content varied from 0 to 1.2 parts per million.—Chem. & Drug. 1914, v. 85, p. 20.

Moore, J. Walker: Nitric acid and carbolic acid are the best caustic solutions for use in the treatment of chancroids.—Merck's Arch. 1914, v. 16, p. 78.

ACIDUM OLEICUM.

Twitchell, E.: The melting and solidifying points of mixtures of fatty acids and the use of these points to determine the composition of such mixtures.—J. Ind. & Eng. Chem. 1914, v. 6, p. 564–569.

Fachini and Dorta: A contribution to our knowledge of the fatty acids and the detection of arachinic acid.—Chem.-Ztg. 1914, v. 38, p. 18.

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Meigen and Winogradoff: The action of halogens on oleic acid and the determination of the iodine number of fats.—Ztschr. ang. Chem. 1914, v. 27, p. 241–244.

Baker, W. L.: Congealing point of oleic acid was found to be 14°, which is high. Notable quantities of palmitic and stearic acids were present.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

E'we, G. E.: Of three lots of oleic acid examined, two were considered satisfactory, while one had a slight excess of palmitic and stearic acids, and a specific gravity of 0.890.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 152.

Roberts, J. G.: A distinct improvement has been noticed in the quality of oleic acid. Every one of the seven samples examined complied with all the requirements of the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 152.

Canzoneri and Bianchini: The rancidity of olive oil and the oxidation of oleic acid in presence of light.—Ann. chim. applicata, 1914, v. 1, p. 24–32.

Shaw, T. W. A.: The catalytic reduction of oleic acid and cottonseed oil by means of hydrogen in presence of finely divided nickel.—J. Soc. Chem. Ind. 1914, v. 33, p. 771–774.

For additional comments on fatty acids see Zentralbl. Biochem. Biophys.; Chem. Zentralbl.; Chem. Abstr.

ACIDUM PHOSPHORICUM.

U. S. P. IX: Rubric to read not less than 85 per cent nor more than 88 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

Brunschwig, F.: Process of manufacturing phosphoric acid. U. S. Patent 1,083,429, Jan. 6, 1914.—J. Soc. Chem. Ind. 1914, v. 33, p. 200. See also Haff, M. M., p. 255.

Fox, Paul J.: Alcohol in the manufacture of phosphoric acid and phosphates.—J. Ind. & Eng. Chem. 1914, v. 6, p. 828–829.

E'we, G. E.: Of five lots of phosphoric acid examined, one tested 84.6 per cent instead of the required 85 per cent. The others ranged from 85.3 to 86.2 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 154.

Hill, C. A.: Of 167 samples of phosphoric acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 8 parts per million. The arsenic content varied from 0 to 1.2 parts per million.—Chem. & Drug. 1914, v. 85, p. 20.

ACIDUM PHOSPHORICUM DILUTUM.

U. S. P. IX: Rubric to read not less than 9.5 per cent nor more than 10.5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

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Brown, L. A.: Three samples of diluted phosphoric acid examined; two passed and one adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 120.

ACID, PICRIC.

Kühl, Hugo: On the detection of picric acid.—Pharm. Zentralh. 1914, v. 55, p. 523–524.

Marden and Elliott: The solubility of picric acid between water and several immiscible solvents needs further investigation.—J. Ind. & Eng. Chem. 1914, v. 6, p. 633.

Anon.: Explosion of picric acid due to ignition in a works. Thought to have been an explosion of picric acid dust due to the presence of some foreign substance.—Chem. Tr. J. 1914, v. 55, p. 542.

Wilson, W. T.: Report of 35 cases in which the eruption of pellagra was treated with picric acid gauze combined with administration of picric acid internally.—J. Am. M. Assoc. 1914, v. 63, p. 1599.

Wilcox, Herbert B.: Picric acid as an aid in the treatment of various skin lesions.—Merck's Arch. 1914, v. 16, p. 150–152.

Isnard, E.: The detection of picric acid in urine.—Ann. chim. analyt. 1914, v. 19, p. 100–101; also Répert. pharm. 1914, v. 26, p. 193–194.

ACIDUM SALICYLICUM.

Williams, Joseph H.: The manufacture of salicylic acid.—Pharm. J. 1914, v. 93, p. 293. See also Chem. & Drug. 1914, v. 85, p. 313; and Southern Pharm. J. 1914, v. 7, p. 58.

Kahn, Joseph: Salicylic acid and its derivatives. A review of the chemistry of the several products and their use in the treatment of rheumatism.—Proc. New York Pharm. Assoc. 1914, p. 155–166.

Fernau, Albert: A solution of 1 part salicylic acid in 6 parts of concentrated sulphuric acid is never colorless, always slightly yellowish.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Hill, C. A.: Of 12 samples of salicylic acid examined during the years 1911 to 1913, inclusive, the lead content varied from 0 to 2 parts per million. The arsenic content varied from 0.2 to 0.8 parts per million.—Chem. & Drug. 1914, v. 85, p. 20.

Anon.: The difference in price between synthetic and natural salicylic acid seems to be the only important difference.—Meyer Bros. Drug. 1914, v. 35, p. 327. See also Blumenschein: J. Am. Pharm. Assoc. 1914, v. 3, p. 607.

Hanzlik, Paul J.: The salicylates; a historical and critical review of the literature.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 131–189.

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Serger, H.: A review of some of the recent literature relating to he use of salicylic acid as a chemical preservative.—Chem.-Ztg. 1914, r. 38, p. 244–245.

Kochmann, M.: The objectionable characteristics of salicylic acid ınd of the soluble salicylates include taste, gastric irritation, audi-ory disturbances, renal irritation, and excessive perspiration.—Therap. Monatsh. 1914, v. 28, p. 652.

Baldoni, Alessandro: The transformation of salicylic acid in the animal organism.—Arch. farmacol. sper. 1914, v. 17, p. 241–247. See also v. 18, p. 151–177.

Miller, Joseph L.: The specific action of salicylates in acute articular rheumatism, with a table showing the period of time that patients remained in the hospital with and without salicylate.—J. Am. M. Assoc. 1914, v. 63, p. 1107–1109; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 213–222.

Weinbrenner: The treatment of epithelioma of the skin with salicylic acid.—Münch. med. Wchnschr. 1914, v. 61, p. 127–129.

For additional comments on salicylic acid see Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.; Chem. Zentralbl.; Chem. Abstr.; J. Chem. Soc. Lond.

ACIDUM STEARICUM.

Jäger, A.: Progress in the stearin industry; a review.—Seifensieder Ztg. 1914, v. 41, p. 729.

Twitchell, E.: The melting and solidifying points of mixtures of fatty acids and the use of these points to determine the composition of such mixtures.—J. Ind. & Eng. Chem. 1914, v. 6, p. 564–569.

Mayer, Joseph L.: The melting point of six samples of stearic acid was found to vary from 55 to 58°.—Proc. New York Pharm. Assoc. 1914, p. 115.

Jensen, H. R.: Two especially pure samples of the commercial stearic acid were scarcely entitled to such a description. The figures show a 60 per cent content of palmitic acid, with a trace of oleic acid.—Evans' An. Notes, 1914, p. 66.

Koenig, Alfred E.: On the stearates and palmitates of the heavy metals, with remarks concerning instantaneous precipitations in insulating solutions.—J. Am. Chem. Soc. 1914, v. 36, p. 951–961.

Berg and Angerhausen: The separation of stearin from fats by means of digitonin.—Chem.-Ztg. 1914, v. 38, p. 978–979.

Matthes and Rath: On the separation of dioxy and of tetroxy stearic acid.—Arch. Pharm. 1914, v. 252, p. 699–703.

Kremann and Kropsch: A contribution to the knowledge of natural fats from the standpoint of phase rule.—Monatsh. Chem. 1914, v. 35, p. 561–580, 823–839, 841–857.

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U. S. P. IX: Rubric to read not less than 93 per cent nor more than 95 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

Wagner, T. B.: The contact process for sulphuric acid and its use in connection with the discharge of sulphuric acid fumes from smelters.—J. Ind. & Eng. Chem. 1914, v. 6, p. 73; also Oil, Paint & Drug Rep. 1914, v. 85, February 2, p. 36.

Schlieps, Georg: A modification in the sulphuric acid tower system.—Chem.-Ztg. 1914, v. 38, p. 966.

Hempel, Walter: The chamber process for sulphuric acid. The determination of nitrous oxide in the chamber gases.—Ztschr. ang. Chem. 1914, v. 27, p. 218–223. See also Wentzki, O., p. 312 and p. 512.

Mason, William: An illustrated description of an accessory apparatus for Glover and Gay-Pussac towers.—Chem.-Ztg. 1914, v. 38, p. 800–801.

For patents relating to the manufacture of sulphuric acid see J. Soc. Chem. Ind. 1914, v. 33, p. 135, 200, 201, 234, 311, 482, 483, 485, 539, 692, 864, 865, 919, 961, 1008.

Reusch, K.: A review of the literature of 1913 relating to the manufacture of sulphuric acid.—Chem.-Ztg. 1914, v. 38, p. 385, 415, 441. See also p. 1241–1243.

Uhlmann, P. W.: Norwegian and Spanish pyrites as crude material in the manufacture of sulphuric acid.—Chem.-Ztg. 1914, v. 38, p. 59–60. See also p. 597–598.

Grosh, Daniel M.: A future source and process for manufacturing sulphuric acid. An adaption or modification of the contact or catalyzing process.—Merck's Rep. 1914, v. 23, p. 92–93.

Grégoire, Ach.: The preparation of sulphuric acid free from nitrous compounds.—Bull. Soc. Chim. Belg. 1914, v. 28, p. 23–33.

Tarbell, R. F.: The determination of arsenic in hydrochloric and sulphuric acid.—J. Ind. & Eng. Chem. 1914, v. 6, p. 400–401. See also Koelsch, H.: Chem.-Ztg. 1914, v. 38, p. 5–6.

Nissenson, H.: The determination of arsenic, iron, and mercury in sulphuric acid.—Chem.-Ztg. 1914, v. 38, p. 1097.

Hill, C. A.: Of 22 samples of sulphuric acid examined during the years 1910 to 1913, inclusive, the lead content varied from 2 to 60 parts per million. The arsenic content varied from 0 to 1.5 parts per million.—Chem. & Drug. 1914, v. 85, p. 20.

Schmidt, Ernst: The detection of minute quantities of selenic acid in sulphuric acid.—Arch. Pharm. 1914, v. 252, p. 161–165.

Gazter and Glover: The resistance of platinum vessels to hot sulphuric acid.—Ztschr. anorg. Chem. 1914, v. 87, p. 353–356.

For additional references on sulphuric acid see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

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ACIDUM SULPHURICUM AROMATICUM.

Brown, L. A.: Three samples of aromatic sulphuric acid analyzed. All found to be deficient in sulphuric acid, the strength running from 89.8 to 83.4 per cent of the U. S. P. standard.—Proc. Kentucky Pharm. Assoc. 1914, p. 117.

Ziefle, Adolph: Of 74 samples of aromatic sulphuric acid examined, 35 were not within 10 per cent of official strength.—Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 152–153.

ACIDUM SULPHURICUM DILUTUM.

U. S. P. IX: Rubric to read not less than 9.5 per cent nor more than 10.5 per cent.—J. Am. Pharm Assoc. 1914, v. 3, p. 1564, and Abstr. Prop. Changes, Part 6, 1914, p. 2.

Brown, L. A.: One sample of diluted sulphuric acid analyzed; adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 120.

ACIDUM SULPHUROSUM.

Kedesdy, E.: Observations on the titrimetric determination of free sulphurous acid.—Chem.-Ztg. 1914, v. 38, p. 601–602. See also Sander, Ing. A., p. 1057–1058.

Wright Robert: The absorption spectra of sulphurous acid and sulphites.—Proc. Chem. Soc. 1914, v. 30, p. 264.

Skillern, P. G.: Sulphurous acid in the treatment of furuncles.—New York M. J. 1914, v. 100, p. 1218–1219.

ACIDUM TANNICUM.

Noyes, C. R.: Tannin is almost never U. S. P. and it may contain any amount of impurities.—J. Am. Pharm. Assoc. 1914, v. 3, p. 854; also Proc. Minnesota Pharm. Assoc. 1914, p. 190.

Iljin, Leo F.: On the composition of tannin.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 985–993.

Geake and Nierenstein: Contribution on the constitution of tannin.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 891–898.

Marden, J. W.: The determination of tannin. A study of the methods of extraction by means of immiscible solvents from the point of view of the distribution coefficient.—J. Ind. & Eng. Chem. 1914, v. 6, p. 320.

van Gijn, J. L.: A critical review of the methods for determining tannin.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 691–695; also Bull. sc. pharmacol. 1914, v. 21, p. 292.

Kobert, R.: On the biological detection and valuation of tannins.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 470–495.

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Fischer and Freudenberg: Observations on tannin and the synthesis of related substances.—Ber. deutsch. chem. Gesselsch. 1914, v. 47, p. 2485–2504; also Apoth.-Ztg. 1914, v. 29, p. 835.

Moore, F. J.: Recent synthetic studies in the tannin group; a review.—J. Ind. & Eng. Chem. 1914, v. 6, p. 450–452.

U. S. P. IX: Glycerite to be made by heating a mixture of tannin and glycerin in a suitable wide-mouthed bottle on a water bath.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Llewellyn, H. D.: The formula for glycerite of tannic acid should remain the same. The working directions should be changed.—Proc. Missouri Pharm. Assoc. 1914, p. 143.

Lansens, J.: Ovules of tannin, with directions for making the gelatin base.—Ann. Pharm. Louvain, 1914, v. 20, p. 1–2.

van Wisselingh, C.: On the physiological importance of the tannins.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 956–964; also Bull. sc. pharmacol. 1914, v. 21, p. 290.

Gortner and Banta: Tannin kills all amphibian eggs within 24 hours in a concentration of 0.0125 per cent.—Biochem. Bull. 1914, v. 3, p. 367.

ACIDUM TARTARICUM.

U. S. P. IX: Melting point omitted. Test for lead added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1564–1565, and Abstr. Prop. Changes, Part 6, 1914, p. 2–3.

Dück: A sample of tartaric acid failed to comply with the Ph. Helv. IV hydrogen sulphide test.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 234.

Grossmann, H.: The rotatory dispersion of tartaric and malic acids.—Tr. Faraday Soc. 1914, v. 10, p. 60–69. See also Darmois, E., p. 80–83; and Bruhat, G., p. 84–90.

Scoville, W. L.: Solutions of tartaric, malic, acetic, and formic acids are entirely decomposed by prolonged exposure to sunlight (70 to 200 hours), evolving carbon dioxide.—Bull. Pharm. 1914, v. 28, p. 484.

Astruc, H.: The determination of tartaric acid in potassium bitartrate.—Ann. Falsif. 1914, v. 50, p. 416–417.

Häussler, E. P.: The quantitative determination of tartaric acid in beverages and particularly in wines.—Ztschr. Anal. Chem. 1914, v. 53, p. 542–561; also Schweiz. Apoth.-Ztg. 1914, v. 52, p. 525–527, 553–556, 569–572.

Mann, E. W.: Nineteen samples of tartaric acid have been tested, to only one of which could objection be taken; this yielded 0.40 per cent of ash.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 49.

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Hill, C. A.: Of 467 samples of tartaric acid examined during the years 1910 to 1913, inclusive, the lead content varied from 0.5 to 80 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 20.

Hankey, William T.: One lot of tartaric acid examined showed traces of heavy metals.—Proc. Ohio Pharm. Assoc. 1914, p. 54.

Post, Wilbur E.: The effect of tartrates on the human body.—J. Am. M. Assoc. 1914, v. 62, p. 592. See also Editorial, p. 616.

Salant, William: The pharmacology of sodium tartrate.—J. Am. M. Assoc. 1914, v. 63, p. 1076–1078; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 224–230.

ACIDUM TRICHLORACETICUM.

Heidingsfeld, M. L.: A new method of treating lupus vulgaris by the use of a saturated solution of trichloracetic acid.—J. Am. M. Assoc. 1914, v. 63, p. 1352–1356.

Sommer, E.: A suggestion to use trichloracetic acid as a substitute for carbon dioxides now in dermatology. The latter has many disadvantages.—Critic and Guide, 1914, v. 17, p. 278.

ACONITINA.

Marden and Elliott: From the study of distribution coefficients it is concluded that for aconitine chloroform and benzene are better solvents than ether and that the distribution ratios between these substances and water would be more favorable than in the case of ether.—J. Ind. & Eng. Chem. 1914, v. 6, p. 929.

Macht, D. I.: The action of drugs on the isolated pulmonary artery. Aconitine has a tendency to cause a primary stimulation to contraction, but on the whole had no appreciable effect.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 24.

Redfield, H. Hamilton: A study of aconitine, its physiologic action and therapeutic value.—Am. J. Clin. Med. 1914, v. 21, p. 775–779.

ACONITUM.

U. S. P. IX: Not more than 5 per cent of stem bases and other foreign matter should be present. Ash not exceeding 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 359, and Abstr. Prop. Changes, Part 2, 1914, p. 1.

Anon.: An illustrated description of *Aconitum napellus*.—Chem. & Drug. 1914, v. 84, p. 584.

Maines, E. L.: Aconite root was found to contain from 3.52 to 5.98 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

J. D. Riedel, A.-G.: Aconite contained from 3.6 to 6 per cent of ash and from 28.5 to 32.9 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

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Mann, E. W.—A single specimen of powdered aconite leaves yielded 10.26 per cent of ash.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 6.

Lilly, J. K.: Much of the Japanese aconite root is on the market.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug. Rep. 1914, v. 86, September 30, p. 34.

Caesar & Loretz: The valuation of aconite, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 116–117.

Dichgans, H.: A comparative study of the several official assay methods for aconite and its preparations.—Apoth.-Ztg. 1914, v. 29, p. 392, 403, 414.

U. S. P. IX: To require ether soluble alkaloids of aconite. Assay practically as under belladonna.—J. Am. Pharm. Assoc. 1914, v. 3, p. 986, and Abstr. Prop. Changes, Part 4, 1914, p. 3.

Table showing reported variation in alkaloidal content of aconite root.

Reporters.	Number of samples.	Alkaloidal principles.		References.
		Minimum.	Maximum.	
Caesar & Loretz.....	7	0.754	0.884	Jahres-Ber., 1914, p. 40.
Hankey, W. T.....	4	.53	.55	Proc. Ohio Pharm. Assoc., 1914, p. 50.
Jensen, H. R.....	3	.383	.463	Evans' An. Notes, 1914, p. 5.
Mann, E. W.....	14	.24	.90	Ann. Rep. Southall Bros. & Barclay, 1914, p. 6.
Roberts, J. G.....	5	.31	.54	Proc. Pennsylvania Pharm. Assoc., 1914, p. 128.
Vanderkleed, C. E.....	8	.297	.784	Proc. Pennsylvania Pharm. Assoc., 1914, p. 160.

Dichgans, H.: The several official assay methods for aconite gave from 0.32 per cent, U. S. P., to 0.673 per cent, Ph. Belg. The Panchaud method was found to give correlating and generally satisfactory results.—Apoth.-Ztg. 1914, v. 29, p. 404.

U. S. P. IX: To require that the powdered extract yield not less than 1.8, nor more than 2.2 per cent of the ether soluble alkaloids.—J. Am. Pharm. Assoc. 1914, v. 3, p. 987, and Abstr. Prop. Changes, Part 4, 1914, p. 4.

U. S. P. IX: The tincture is to be assayed before being finished.—J. Am. Pharm. Assoc. 1914, v. 3, p. 544, and Abstr. Prop. Changes, Part 3, 1914, p. 21.

Street, John Phillips: Forty samples of tincture of aconite were analyzed. They contained from 0.013 to 0.051 gm. aconitine per 100 cc. 28 samples being below the U. S. P. standard of 0.045 gm.—Rep. Connecticut Agric. Exper. Sta. 1914, p. 334.

Ziefle, Adolph: Of 97 samples of tincture of aconite examined, 44 were not within 10 per cent of official strength.—Rep. North Dakota Exper. Sta. 1912, 1914, p. 159–160.

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Brown, Lucius P.: One sample of tincture of aconite was found to be illegal.—Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 3, p. 3.

E'we and Vanderkleed: Tincture of aconite was found to form precipitates containing lead.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1685.

Freund, Hans: The composition of tincture of aconite and methods for testing the preparation—Pharm. Zentralh. 1914, v. 55, p. 263–254.

Caesar & Loretz: The toxic action of aconite root does not always comply with the alkaloidal content.—Jahres-Ber. 1914, p. 36.

Alderman, Theodore Davis: In trigeminal neuralgia, the use of aconite will prove specific.—Eclectic M. J. 1914, v. 74, p. 7.

Jones, J. M.: Aconite has been found useful in the treatment of pruritus.—Ellingwood's Therap. 1914, v. 8, p. 136.

ADEPS.

Helch, Hans: The tests for adeps should include a congealing point requirement and tests for plant oils.—Pharm. Post, 1914, v. 47, p. 571.

Anon.: By the new hardening process the American manufacturers are using in the manufacture of lards and cooking fats, a much larger share of cotton seed oil can be used therein than heretofore.—Montreal Pharm. J. 1914, v. 25, p. 180.

Sprinkmeyer and Diedrichs: The detection of plant fats in animal fats.—Ztschr. unters. Nahr. u. Genussm, 1914, v. 28, p. 236–244.

Fischer and Wewerinke: The detection of tallow in lard by the method of Polenski and Bömer.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 361–378. See also Sprinkmeyer and Diedrichs, p. 571–581.

Alpers, Kave: Contributions on the valuation of lard, with a report on 85 samples.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 142–152.

Gift, W. J.: Lard is not a very satisfactory base for ointments because it becomes rancid.—Proc. Indiana Pharm. Assoc. 1914, p. 59.

Table showing some of the analytical results reported for lard.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Baker, W. L.	2	2	Proc. Am. Assoc. Pharm. Chem., 1914, p. 210.
Barnard, H. E.	22	5	Rep. Indiana Bd. Health, 1914, p. 397.
Foust, James	4	3	Bull. Pennsylvania D. & F. Div. 1914, v. 12, Nos. 1 and 2, p. 35.
Hortvet, Julius	64	36	Rep. Minnesota D. & F. Com. 1914, p. 47, 63.
Jaffa, M. E.	13	5	Rep. California Bd. Health, 1910–1912, Sacramento, 1913, p. 287.
Lynch, R. L.	37	23	Rep. District of Columbia Health Off. 1913, Washington, 1914, p. 90.
Shannon, F. L.	39	19	Bull. Michigan D. & F. Dept. 1914, January-February, p. 10, March-April, p. 13, July-August, p. 20, November-December, p. 15.
Strode, Sylvanus E.	10	2	Rep. Ohio D. & F. Div. 1914, p. 122.

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ADEPS BENZOINATUS.

U. S. P. IX: To direct 10 gm. of Siam benzoin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1565, and Abstr. Prop. Changes, Part 6, 1914, p. 3.

Ziefle, Adolph: Of 75 samples of benzoinated lard examined 30 were not standard.—Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 144–147.

ADEPS LANÆ.

Scoville, W. L.: Adeps lanæ sometimes contains sulphur compounds in appreciable amounts.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Fernau, Albert: The detection of cholesterin is more readily accomplished in solution of acetic anhydride than in chloroform. For the determination of free fatty acids the use of benzol as a solvent is recommended.—Ztschr. Allgem. ësterr. Apoth.-Ver. 1914, v. 52, p. 227. p. 227.

Gift, W. J.: Wool fat, or lanolin, is used by itself when the medicinal substance is desired to produce a systemic effect; such preparations are called diadermic.—Proc. Indiana Pharm. Assoc. 1914, p. 59.

ADEPS LANÆ HYDROSUS.

Wilbert, M. I.: Lanolin is included in a number of the European pharmacopœias, either as the official title or as a synonym.—J. Am. Pharm. Assoc. 1914, v. 3, p. 655.

Jensen, H. R.: Sixteen samples of lanolin gave very uniform figures: Saponification value, 92.5 to 100.2; iodine value, 41.7 to 48.3.—Evans's An. Notes, 1914, p. 40.

Salomon, Hans: The determination of the unsaponifiable constituents of the official oils and fats and of lanolin by the digitonin method.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 189–193.

Helch, Hans: Hydrated wool fat loses water in the exposed layers, becomes darker in color, and for this reason is frequently objected to. The lanolin preparation of the Ph. Germ. V, which contains a small amount of liquid petrolatum, has the tendency to hold the contained water more securely.—Pharm. Post, 1914, v. 47, p. 571.

Wester, D. H.: Cans of hydrated wool fat were found to be approximately 15 per cent short in weight. On inquiry the dealer expressed the belief that this practice had prevailed for many years.—Pharm. Weekblad, 1914, v. 51, p. 1439.

ÆTHER.

U. S. P. IX: Rubric to read from 95.5 per cent to 97.5 per cent by weight of ethyl oxide. Ether for anesthesia to be dispensed only in small well-closed containers. Specific gravity to read from 0.713

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to 0.716 at 25°. Boiling point about 35°. Modified tests for aldehyde and added tests for peroxides. Test for undue amount of alcohol or water omitted.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1565, and Abstr. Prop. Changes, Part 6, 1914, p. 3.

Finnemore, H.: Anesthetic ether of commerce.—Pharm. J. 1914, v. 92, p. 138–139. For discussion see p. 160; also Year-Book of Pharmacy, 1914, p. 380–385. For discussion see p. 385–388.

Herzog, J.: Ether for anesthesia and the care necessary to prevent contamination.—Apoth.-Ztg. 1914, v. 29, p. 68–69.

Anon.: According to the Ph. Brit. V, ether may now be prepared from industrial methylated spirit and may be used for all pharmaceutical purposes.—Chem. & Drug. 1914, v. 85, p. 488.

Orrick and Vanderkleed: One sample of ether examined was practically free from alcohol and water, instead of containing about 4 per cent, as required by the U. S. P. This sample had a specific gravity of 0.713 instead of 0.716.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 137.

Bonz and Sohn: The nature of the cork extract found in ether and the possible influence of this extract.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70–71. See also Herzog, J., p. 72, and p. 121.

Fernau, Albert: The concentration of the solution of potassium iodide for the detection of ethyl peroxide in ether is an important factor. A 10 per cent solution in recently boiled water is reliable.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Helch, Hans: The potassium iodide test is a rather severe one for ether to be used for ordinary commercial purposes. The test with alkali hydroxide does not always suffice to detect aldehydes and vinyl alcohol.—Pharm. Post, 1914, v. 47, p. 571.

Frerichs, G.: Ether prepared from denatured alcohol frequently contains contaminations, more particularly, methylethyl ether and acetone, that reduce its boiling point. The determination of this factor is, therefore, important.—J. Pharm. Elsass-Lothr. 1914, v. 41, p. 235.

Barton, P. F.: To avoid mistaking chloroform for ether, it is suggested to have chloroform colored red and ether colored green.—Lancet, 1914, v. 187, p. 60. See also Editorial: Pharm. J. 1914, v. 92, p. 42; and Clark, W. Inglis: Year-Book of Pharmacy, 1914, p. 416–417.

Anon.: The normal freezing point of ethyl ether has been determined by Henning as —123.6°.—Nature, 1914, v. 93, p. 16.

Boothby, Walter M.: The determination of the anesthetic tension of ether vapor in man, with some theoretical deductions therefrom, as to the mode of action of the common volatile anesthetics.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 379–392.

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Gwathmey, James T.: Oil-ether anesthesia. An attempt to abolish inhalation anesthesia.—New York M. J. 1914, v. 99, p. 211–214. See also Editorial, p. 642.

Jones, Rupert Llewellyn: Ether anesthesia by the intratracheal method. A report of 49 cases.—Lancet, 1914, v. 187, p. 1087–1089. See also Pratt, J. P.: J. Am. M. Assoc. 1914, v. 62, p. 37–38.

Page, H. M.: Intrapharyngeal administration of warmed ether vapor by the nasal route; with an illustration of the apparatus.—Lancet, 1914, v. 187, p. 156.

Luke, H. Clifton: Ether-oil rectal anesthesia; some theoretical considerations.—Med. Rec. 1914, v. 85, p. 839–840.

Coburn, Raymond C.: Increase in toxication of ether by new methods of administration.—J. Am. M. Assoc. 1914, v. 62, p. 364.

Fisk, Tracy L.: Safeguarding the ether and chloroform bottles against the possibility of driving liquid ether or chloroform down the patient's throat, etc.; illustrated.—J. Am. M. Assoc. 1914, v. 62, p. 38.

Gallant, A. Ernest: An improved ether inhaler.—New York M. J. 1914, v. 100, p. 861–862.

Sheaff, Philip Atlee: An aid in the use of the Allis inhaler; illustrated.—New York M. J. 1914, v. 100, p. 421–422.

Whiting, Maurice H.: Anesthetics in eye work. Table enumerating the operations performed in the In-patient Theater, Royal London Ophthalmic Hospital, under general anesthetics, 1909–1913, inclusive.—Brit. M. J. 1914, v. 2, p. 471. See comments by Marshall, C. Devereux, also Traquair, H. M., p. 541.

Githens and Meltzer: The nature of the cessation of respiration in deep ether anesthesia.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 523.

Flagg, Paluel J.: A previously unemphasized feature in the construction of nitrous oxide-oxygen-ether apparatus.—J. Am. M. Assoc. 1914, v. 62, p. 35–36.

Guy, W.: For prolonged dental operations, nitrous oxide and ether, in mixture or sequence, is of proved value.—Dental Cosmos, 1914, v. 56, p. 1295.

Fairlie, H. P.: A comparison of the actions of chloroform and ether on the blood pressure.—Lancet, 1914, v. 186, p. 603–606. See also Walton, Albert, p. 714; and Smith, G. McCall, p. 784–785.

Báron and Barsony: On the action of chloroform and of ether narcosis on the motor function of the stomach.—Arch. ges. Physiol. 1914, v. 158, p. 464–477.

Buck, Leonard W.: Effects of chloroform and of ether anesthesia on the protein contents of the blood serum of rabbits.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 553–557.

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DeTarnowsky, George: A preliminary clinical report of 30 cases of infection treated by the Souligoux-Morestin method of ether lavage.—J. Am. M. Assoc. 1914, v. 62, p. 281–282.

Jeanneret, L.: Practical experience would seem to sustain Souligoux's claim as to the advantages of ether for lavage of the peritoneum.—J. Am. M. Assoc. 1914, v. 62, p. 578.

Santy, P.: Report of a series of experiments on rabbits to determine the immediate and after effects of flushing out the peritoneum extensively with ether.—J. Am. M. Assoc. 1914, v. 62, p. 1587.

For additional references on ether see Index Med.; Zentralbl. Exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

ÆTHER ACETICUS.

Szeberenyi, P.: The examination of acetic ether.—Ztschr. Anal. Chem. 1914, v. 53, p. 683.

Fernau, Albert: The neutral reaction of acetic ether is met with only in recently distilled preparations. The commercial preparation is frequently acid.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 227.

Fletcher and Jones: Equilibrium in the system; ethyl alcohol, acetic acid, ethyl acetate and water, and its apparent displacement by mineral chlorides.—J. Chem. Soc. Lond. 1914, v. 105, p. 1542–1547.

ÆTHYLIS CHLORIDUM.

Liberati, T.: Some ethyl chloride is sold in nickeled brass tubes with the nozzle attachment and sealed in the tube with white lead, but no metallic contamination could be detected in the ethyl chloride.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 138.

Berthelot, Albert: On the use of ethyl chloride for the sterilization of microbial vaccines and the preparation of bacterial vaccines.—Compt. rend. Soc. biol. 1914, v. 76, p. 29–30.

Guy, W.: Ethyl chloride is stated to be 200 times as dangerous as nitrous oxide. Like chloroform, it can cause vagal inhibition, and this constitutes its chief danger.—Dental Cosmos, 1914, v. 56, p. 1296.

AGAR AGAR.

U. S. P. IX: The dried mucilaginous substance extracted from *Gracilaria* (*Sphærococcus*) *lichenoides* Greville, and other marine *algæ* growing along the eastern coast of Asia. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 360, and Abstr. Prop. Changes, Part 2, 1914, p. 2.

Gehe & Co.: The production of agar agar in Japan, with a table showing the amount and the value of the drug exported to different countries in 1910 and 1911.—Handelsbericht, 1914, p. 46–47.

Digitized by Google

Anon.: Several illustrations showing the method of preparing agar agar.—Southern Pharm. J. 1914, v. 6, p. 548.

Alsberg, C. L.: It does not appear that the term "vegetable gelatin" is a correct designation for agar agar, as it is not a gelatin and can not be considered a substitute for it, except in its power to form a jelly with water.—S. R. A.-Chem. 1914, p. 205.

Lilly, J. K.: One sample of powdered agar agar was found to be adulterated with corn starch.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Rippetoe, J. R.: Four samples of agar agar contained from 4.4 to 8.23 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 444.

Bastedo, W. A.: Agar agar absorbs water and increases greatly in bulk, so that it softens and enlarges the fecal mass.—Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 153. See also Editorial: Drug Topics, 1914, v. 29, p. 163.

Einhorn, Max: Agar agar as a basis for medicaments for internal administration, with formulas for a number of preparations, including phenolphthalein agar, rhubarb agar, and ipecacuanha agar.—D.-A. Apoth.-Ztg. 1914, v. 35, p. 34–35.

ALBUMEN.

Beringer, George M.: A proposed N. F. monograph for Albumen Ovi Recens, fresh egg albumen. The freshly separated liquid white of recently laid eggs of the hen *Gallus domestica* Temminck (Fam. Phasianidae).—J. Am. Pharm. Assoc. 1914, v. 3, p. 873. See also p. 877 and 879.

Waterman, N.: On the differentiation between hen albumen and duck albumen and the utilization of the product for commercial purposes.—Chem. Weekblad, 1914, v. 11, p. 120–126.

Landsteiner, Karl: A further contribution on albumin derivatives.—Biochem. Ztschr. 1914, v. 58, p. 362–364.

Berceller, L.: Historical remarks on albumin and peptone solutions.—Kolloid-Ztschr. 1914, v. 14, p. 1–2.

Ringer, W. E.: The behavior of albumin to salts in solutions of varied concentration.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 911–923.

Editor "Therapeutics": The value of raw egg white, or egg albumen, as a nutrient has been very much overlauded, and dependence on egg albumen as a food in serious conditions is a mistake.—J. Am. M. Assoc. 1914, v. 62, p. 615.

ALCOHOL.

Berger: A review of a recent communication on the history of alcohol; the Arabic source of the product.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 521–522.

Digitized by Google

Boysen-Jensen, P.: The decomposition of sugar in the course of alcoholic fermentation.—Biochem. Ztschr. 1914, v. 58, p. 451–466.

Kostytschew, S.: An experimental study on the formation of acetaldehyde during alcoholic fermentation.—Biochem. Ztschr. 1914, v. 64, p. 237–250. See also comments by Neuberg and Kerb, p. 251–256, and reply by Kostytschew, S., p. 367–372.

Chenard, E.: The principles of the distillation of alcohol.—Bull. Soc. chim. France, 1914, v. 15, p. 592–595.

Thatcher, F.: Process of making alcohol. U. S. Patent 1,096,965, May 19, 1914.—J. Soc. Chem. Ind. 1914, v. 33, p. 659. See also Ekstrom, G., p. 659.

Chenard, E.: The theory of the fractional distillation of mixtures of water and alcohol.—Bull. Soc. chim. France, 1914, v. 15, p. 646–649.

Wagner, T. B.: The production of ethyl alcohol from lumber waste.—J. Ind. & Eng. Chem. 1914, v. 6, p. 74. See also Kressmann, F. W.: Chem. Eng. 1914, v. 20, p. 147–151; and Cohn, Robert: Pharm. Ztg. 1914, v. 59, p. 62–63.

True, Rodney H.: The extensive alcohol industry of Germany as an individual industry has proven a failure, but as a part of an economic farming arrangement it has not been a failure.—Meyer Bros. Drug. 1914, v. 35, p. 68.

Rakshit and Sinha: A table of specific gravities of spirits corresponding to indications of glass hydrometers for use with Bedford's corrected Sikes' tables.—J. Soc. Chem. Ind. 1914, v. 33, p. 288–289. See also p. 619; Joseph and Rae, p. 991–992; and Carter, F. G., p. 993–994.

Barendrecht, H. P.: Alcoholometry and rational fractionation.—Proc. Chem. Soc. 1914, v. 30, p. 160–161.

van der Wal, G. H.: The desirability of adopting a uniform method of expressing in degree of weight the alcohol content of medicinal preparations.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 529–533.

Enz, Karl: Observations on the miscibility of chloroform and of alcohol.—Pharm. Zentralh. 1914, v. 55, p. 954–955.

Salkowski, E.: The detection of methyl alcohol by means of the method suggested by Denigès and the import of its detection.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 225–236.

Asser, Ernst: Observations on the variation in methyl alcohol oxidation by other alcohols.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 322–334.

Dunning, H. A. B.: Detection and estimation of methyl alcohol in presence of ethyl alcohol, and of minute quantities of formaldehyde in presence of hexamethylenamine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 637–641.

Digitized by Google

Blanksma, J. J.: Observations on the identification of ethyl and of methyl alcohol.—Chem. Weekblad, 1914, v. 11, p. 26–29.

Richter, Erw.: The determination of alcohol in galenical preparations.—Pharm. Ztg. 1914, v. 59, p. 430–431.

Mossler and Markus: A rapid, simple, and readily followed method for the determination of the alcohol content of tinctures.—Pharm. Post, 1914, v. 47, p. 291–294, 315–318.

Anselmino, O.: The determination of the alcohol content of tinctures, with a review of the methods employed.—Arb. pharm. Inst. Univ. Berl. 1914, p. 27.

E'we and Vanderkleed: Alcohol determinations in the presence of glycerin.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 275.

Suider, H. F.: The methods of alcohol determination in general practice are still more or less inaccurate. The distillation method described in Leach's "Food Inspection and Analysis" appears to be the most satisfactory method.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 201.

Noyes, C. R.: Commercial alcohol, as it is ordinarily sold, is 94 per cent. It is to a certain degree impure. "U. S. P. alcohol," costing but a few cents more, is the old cologne, or deodorized spirits, and contains 95 per cent alcohol. It is hardly at all more expensive if you consider the increased strength.—J. Am. Pharm. Assoc. 1914, v. 3, p. 853; also Proc. Minnesota Pharm. Assoc. 1914, p. 189.

Scoville, W. L.: Alcohol is frequently 96 to 97 per cent, with objectionable amounts of nonvolatile matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Lythgoe, Hermann C.: Of 86 samples of alcohol examined, 14 were adulterated.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 410.

McCaffrey, J. C.: Of 76 lots of alcohol examined, only 1 tested below 95 per cent. A few samples had molasseslike odors and were evidently distilled from cane.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 128.

Todd, A. R.: Two samples of alcohol examined were found to be adulterated.—Bull. Michigan D. & F. Dept. 1914, September-October, p. 16, July-August, p. 26.

Weinstein, Joseph: Of 12 samples of alcohol purchased in small amounts in New York City, 5 were ethyl alcohol and 7 wood alcohol, variously labeled acetone alcohol and Columbian spirit.—Proc. New York Pharm. Assoc. 1914, p. 115.

Ranwez, F.: A report of a committee appointed to consider the use of tax-free alcohol in the making of pharmaceutical preparations.—Rev. internat. pharm. Brux. 1914, v. 2, p. 115–117.

Editorial: Comment on the proposition to regulate the sale of alcohol by druggists.—Am. Druggist, 1914, v. 62, p. 444.

Digitized by Google

McRae, W. A.: Many of the widely advertised and dangerous "cure-alls" (patent medicines) found on the market contain as much as 25 per cent alcohol.—Rep. Florida Dept. Agric. 1914, p. 30.

Anon.: A reprint of a list of medicinal preparations that are classed as liquors.—N. A. R. D. Notes, 1914, v. 18, p. 1284.

Wilbert, M. I.: Alcohol containing preparations that can be or are used as substitutes for alcoholic beverages should be deleted from future revisions of the Pharmacopœia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1663.

Mitchell, James C.: Alcohol as a medicament should be used sparingly or not used internally at all. About the only use for it is locally as an antiseptic in external wounds.—Nat. Eclect. M. Assoc. Quart., 1914–15, v. 5, p. 350–353.

Maus, L. Mervin: Alcohol and racial degeneracy.—Med. Rec. 1914, v. 85, p. 102–105.

Gordon, Alfred: Administration and prophylactic measures against alcoholism; a review.—J. Am. M. Assoc. 1914, v. 62, p. 194–196.

Detwiler, A. K.: Alcoholism is a social disease and not a secret vice.—Am. J. Clin. Med. 1913, v. 20, p. 747.

Rosenfeld, Rudolf A. P.: On the specificity of alcohol habituation.—Ztschr. Immun. u. exper. Therap. 1914, v. 21, p. 228–230.

Hunter, Arthur: Alcohol in moderate quantities is a food but a very dangerous food.—J. Am. M. Assoc. 1914, v. 62, p. 642.

Friedenwald, Julius: The toxicity of alcoholic beverages is not proportionate to the percentage of the alcoholic content, but rather to other substances which they contain. The liqueurs and rum are the most toxic of all drinks; beer and ale are about as toxic as whisky.—Spatula, 1912–1913, v. 19, p. 18.

Klopp, Henry I.: The relation of alcoholism to insanity.—Hahnemann. Month. 1914, v. 49, p. 673–685.

Spitzig, B. L.: A new and logical treatment for alcoholism, the diet being modified to contain an abundance of sugar.—J. Am. M. Assoc. 1914, v. 62, p. 193.

Wingfield, Hugh: Instruction in the nature of alcoholism, as well as in the nature of its treatment, should be given more definitely in our medical schools.—Lancet, 1914, v. 186, p. 76. See also Cooper, J. W. Astley, p. 147.

Harris, Wilfred: Some experiences with alcohol injection in tri geminal and other neuralgias.—J. Am. M. Assoc. 1914, v. 63, p. 1725–1730.

Whiting, A. D.: The chemical sterilization of the skin is being limited to the use of alcohol in from 60 to 80 per cent strength.—J. A. M. Assoc. 1914, v. 63, p. 475; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 141.

Digitized by Google

Ahlfeld, F.: Alcohol owes its unique efficacy in local sterilization to its power of penetrating deep into the tissues, and thus being able to destroy the superficial and the deep germs.—(Ztschr. Geburtsh. u. Gynäkol. v. 75, No. 3) J. Am. M. Assoc. 1914, v. 62, p. 1443.

Franceschi, I. B.: On the action of methyl and of ethyl alcohol on the living organism, their products of transformation and their chemico-toxicological detection.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 838–855.

Kuno, Yas: On the action of equivalent alcohols on the isolated mammalian heart, with tables showing experimental results with methyl alcohol, ethyl alcohol, propyl-alcohol, butyl-alcohol, and amyl-alcohol.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 399–415.

Burton, Opitz: The effect of inhalation of alcohol on the viscosity of blood.—Am. J. Physiol. 1914, v. 35, p. 265–267.

Harford, Charles F.: Alcohol and the war.—Brit. M. J. 1914, v. 2, p. 1120.

Jenkins, B. O.: Alcohol as a fuel.—Sci. Am. 1914, v. 111, p. 409.

Mohn, O.: The use of alcohol in automobile motors.—Ztschr. ang. Chem. 1914, v. 27, p. 558–559.

For additional comments on alcohol see Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.; Chem. Zentralbl.; Index. Med.; J. Am. M. Assoc.; Chem. Abstr.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

ALCOHOL ABSOLUTUM.

Havenhill, L. D.: The use of the term "absolute alcohol" to indicate an alcohol which is absolute in one part and not absolute in another part of the book, is confusing.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1301.

Editorial: Absolute alcohol, and the use of alcohol in the manufacture of certain fine chemicals.—Chem. & Drug. 1914, v. 85, p. 424.

ALCOHOL, DENATURED.

Editorial: Duty-free alcohol in chemical industries.—Pharm. J. 1914, v. 93, p. 316.

Editorial: A review of recent developments in the industry relating to the use of denatured alcohol in the United Kingdom, France, and Germany.—Oil, Paint & Drug Rep. 1914, v. 85, March 30, p. 9.

van Ekenstein and Blanksma: The denaturing of alcohol and the uses to which this material is being put.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 1103–1104.

Richard, F.: A rapid method for the detection of substitution of denatured alcohol in rectified alcohol.—J. pharm. et chim. 1914, v. 10, p. 429–437.

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Hankey, William T.: Four samples of denatured alcohol were found to contain from 93.75 to 94 per cent by volume of alcohol.—Proc. Ohio Pharm. Assoc. 1914, p. 50.

Anon.: Cubes of "solid alcohol" are coming into use in Germany and, to some extent, in America, for cooking, heating curling irons or small quantities of water, and for any purpose which requires a small amount of heat for a short time.—Spatula, 1914, v. 20, p. 180.

Wilbert, M. I.: The use of solidified alcohol for rubbing and for general disinfection purposes is meeting with increasing popularity. The production of alcohol in solid form would appear to offer a possibility for denaturing the product in such a way as to make the tax-free article available for external use in medicine.—Am. J. Pharm. 1914, v. 86, p. 563.

Anon.: To make solidified alcohol, heat 500 parts of 90 per cent alcohol over a water bath to about 140° F. and add to it 1 part of gum lac and 15 parts of dry Venetian soap. To facilitate dissolution the soap should be finely grated and the solution will require repeated shaking.—Spatula, 1914, v. 20, p. 646.

Anon.: To produce a solid form of alcohol dissolve 8.5 gm. stearic acid in about 50 gm. of alcohol and 1.35 gm. caustic soda in about 40 gm. of alcohol, mix and warm until the two solutions combine. Pour into molds.—Bull. Pharm. 1914, v. 28, p. 350.

Laubenheimer, K.: The use of solidified alcohol for disinfecting the hands.—Hyg. Rundschau, 1914, v. 24, p. 501–507. See also Süpfle, Karl.: Münch. med. Wchnschr. 1914, v. 61, p. 2017–2018; and Prym, O., p. 2194.

Borrmann, Käthe: The utilization of solid alcohol in obstetrical practice.—Hyg. Rundschau, 1914, v. 24, p. 317–325.

Editorial: A suggestion to enlarge on the possible uses of denatured alcohol for fuel and power purposes.—Nat. Drug. Clerk, 1914, v. 2, p. 518–519.

ALCOHOL, METHYL.

McElhenie, T. D.: Proposed label for wood naptha or wood alcohol.—N. A. R. D. Notes, 1914, v. 18, p. 631.

News Note: Columbian spirit is to be marketed in the future as methanol.—Oil, Paint & Drug Rep. 1914, v. 86, December 7, p. 48.

Murray, B. L.: Considerable additional legislation to restrict the sale of methyl alcohol may be expected in the near future.—Oil, Paint & Drug. Rep. 1914, v. 86, September 30, p. 34.

Blanksma, J. J.: Observations on the identification of ethyl and of methyl alcohol.—Chem. Weekblad, 1914, v. 11, p. 26–29.

Dunning, H. A. B.: Detection and estimation of methyl alcohol in presence of ethyl alcohol and of minute quantities of formaldehyde

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in presence of hexamethylenamine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 637–641.

Vivario, R.: The detection of methyl alcohol in spirits.—J. pharm. et chim. 1914, v. 10, p. 145–147.

von Fellenberg, Th.: On the detection of methyl alcohol according to Denigès.—Mitt. Lebensm. Hyg. 1914, v. 5, p. 259–261. See also p. 172–178.

Wirthle, F.: The detection and determination of methyl alcohol by utilizing the difference of the boiling points of methyl and ethyl iodide to separate the two by distillation.—Pharm. Zentralh. 1914, v. 55, p. 34–36.

Rinck, A.: The detection of methyl alcohol. Outline of method used and an illustrated description of the apparatus.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 98–99.

Manzoff, Christo D.: A new color reaction for the detection of methyl alcohol by means of vanillin.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 469–470.

Anon.: A book review calls attention to a book by Hugo Bauer on the analytical chemistry of methyl alcohol.—Ber. Pharm. Gesellsch. 1914, v. 24, p. 195.

Bone and Davies: The thermal decomposition of methyl alcohol.—J. Chem. Soc. Lond. 1914, v. 105, p. 1691–1696.

Asser, Ernst: On the variation in the methyl alcohol oxidation by other alcohols.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 323–324.

Hankey, William T.: Eight samples of wood alcohol were found to contain from 91.67 to 93.6 per cent of methyl alcohol.—Proc. Ohio Pharm. Assoc. 1914, p. 50.

Croner, Fr.: The influence of methyl alcohol on the disinfectant action of formaldehyde.—Ztschr. Hyg. 1914, v. 78, p. 541–554.

Jackson, Cook and Strickland: Wood, or methyl, alcohol is a subtle poison which may cause complete blindness or even death to the user if it be inhaled, taken internally, or applied externally.—Rep. Rhode Island F. & D. Com. 1914, p. 18. See also McRae, W. A.: Rep. Florida Dept. Agric. 1914, p. 27.

Van Blarcom, Carolyn, C.: Both sides of the methyl alcohol question. Criticism of a letter by Carleton Ellis, with a reply from Ellis.—Am. Perf. 1914, v. 9, p. 14–15.

Kroeber, Ludwig: A discussion of the toxicity of methyl alcohol.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 833–837.

Tyson and Schoenberg: Experimental researches in methyl alcohol inhalation.—J. Am. M. Assoc. 1914, v. 63, p. 915–921.

Kuno, Yas: On the action of equivalent alcohols on the isolated mammalian heart, with tables showing experimental results with methyl alcohol, ethyl alcohol, propyl-alcohol, butyl-alcohol, and

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amyl-alcohol.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 399–415.

Franceschi, T. B.: The action of methyl alcohol and of ethyl alcohol on the living organism.—Bull. sc. pharmacol. 1914, v. 21, p. 78–81; also Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 838–855.

A book review calls attention to a volume by Ritter on cases of methyl alcohol poisoning in Germany.—Südd. Apoth.-Ztg. 1914, v. 54, p. 113; also Pharm. Ztg. 1914, v. 59, p. 145.

Editorial: Nearly a thousand cases of poisoning attributed to wood alcohol have been reported in the literature since 1893, the date which marks the advent of methyl alcohol of a high grade of purity.—J. Am. M. Assoc. 1914, v. 62, p. 538–539.

Woods, Hiram: The difficulty in securing the conviction of persons selling wood alcohol is great everywhere.—J. Am. M. Assoc. 1914, v. 63, p. 921.

For additional references see Index Med.; Zentralbl. Exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

ALOE.

U. S. P. IX: Includes Cape aloes. Each variety of the drug described separately. Ash not exceeding 4 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 361, and Abstr. Prop. Changes, Part 2, 1914, p. 2.

Matute and Bascunana: Aloes of the Spanish Pharmacopœia. A comparison of the requirements embodied in the Spanish, German, Austrian, Belgian, British, United States, French, Swiss, and Spanish Pharmacopœias.—Farm. Espn. 1914, v. 46, p. 742–746.

Noyes, C. R.: Aloes frequently contains varying proportions of peameal, etc., when sold in powdered form.—J. Am. Pharm. Assoc. 1914, v. 3, p. 855; also Proc. Minnesota Pharm. Assoc. 1914, p. 191.

Scoville, W. L.: One lot of aloes was free from aloin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Linke, H.: One sample of aloes was found to contain 3 per cent of ash. The objection being raised to the low ash content permitted by the Ph. Germ. V, 30 samples of the drug were examined and found to contain from 0.8 to 0.96 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 501.

Maines, E. L.: Aloes, Socotrine, was found to contain from 4.63 to 8.95 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Rippetoe, J. R.: Fourteen samples of aloes contained from 74.14 to 97.20 per cent of alcohol extract, from 52.71 to 82.16 per cent of water extract and from 0.81 to 6.50 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 436.

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Roberts, J. G.: An examination of four lots of Socotrine aloes showed that only one of them complied with the requirements of the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 128.

E'we, G. E.: Of eight lots of aloes tested, all were within the U. S. P. limit of 10 per cent of moisture, ranging from 3.9 to 9.9 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 128.

Warren, L. E.: The detection of emodin-bearing drugs in presence of phenolphthalein. The method did not give satisfaction with aloes.—Am. J. Pharm. 1914, v. 86, p. 444–449.

Mann, E. W.: Water soluble matter in 20 samples of aloes ranged from 33.0 to 72.5 per cent, ash from 0.80 to 3.80 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 6.

U. S. P. IX: The tincture is to be made from Socotrine aloes.—J. Am. Pharm. Assoc. 1914, v. 3, p. 544, and Abstr. Prop. Changes, Part 3, 1914, p. 22.

ALOINUM.

Vanderkleed, C. E.: Of the five samples of aloin examined, all left weighable residues on ignition, amounting to from 0.19 to 0.73 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 129.

Roberts, J. G.: Most of the available aloin contains an excess of inorganic matter.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 128.

Léger, E.: A new method for transforming barb aloin into beta barbaloin.—Compt. rend. Acad. sc. 1914, v. 158, p. 1903–1905; also J. pharm. et chim. 1914, v. 10, p. 108–111.

Léger, E.: The optical isomerides of homonataloin and of nataloin and their reciprocal transformation.—Compt. rend. Acad. sc. 1914, v. 158, p. 185–188; also J. pharm. et chim. 1914, v. 9, p. 585–595.

ALTHÆA.

U. S. P. IX: Description is considerably elaborated. Qualitative chemical test for the drug introduced. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 361, and Abstr. Prop. Changes, Part. 2, 1914, p. 3.

Anon.: A description of *Althæa officinalis*, and an illustration showing a flowering branch of this plant.—Chem. & Drug. 1914, v. 85, p. 110.

Maines, E. L.: Althæa root was found to contain from 8.18 to 10.53 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Linke, H.: A limitation for ash would be a desirable addition to the pharmacopœia. One sample examined was found to give 4.8 per cent.—Apoth.-Ztg. 1914, v. 29, p. 567.

Rippetoe, J. R.: Two samples of althæa root were found to contain 21.22 and 28.60 per cent of water soluble extract, and 7.08 and 6.93 per cent of ash, respectively.—Am. J. Pharm. 1914, v. 86, p. 436.

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J. D. Riedel, A.-G.: Althæa root contained from 4.6 to 6.1 per cent of ash, and from 42.2 to 58.3 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

ALUMEN.

Linke, H.: Commercial alum usually contains an excess of iron but is otherwise satisfactory.—Apoth.-Ztg. 1914, v. 29, p. 673.

Haas, B.: The separation of the several alums into their constituents.—Chem.-Ztg. 1914, v. 38, p. 994.

Kratzmann, Ernst: The microchemical detection and distribution of aluminum in plants, with a table giving a list of plants in which aluminum was found.—Pharm. Post. 1914, v. 47, p. 101–102, 109–113.

Jaffa, M. E.: Of three samples of alum examined, one was adulterated.—Rep. California Bd. Health (1910–1912) Sacramento, 1913, 1914, p. 297.

Anon.: A formula for alum points containing potassium alum, borax, zinc oxide, and formaldehyde.—Pharm. Zentralh. 1914, v. 55, p. 7.

Remsen, Ira: Contribution from the referee board of consulting scientific experts. Professional paper on alum in foods. The board concludes that alum baking powders are no more harmful than any other baking powders, but that it is wise to be moderate in the use of foods that are leavened with baking powder.—Bull. U. S. Dept. Agric. 1914, No. 103, pp. 7; also Am. Food J. 1914, v. 9, p. 188–191. and Oil, Paint & Drug. Rep. 1914, v. 85, May 4, p. 18.

Editorial: A very simple application for rhus poisoning is alum. A small cake of alum moistened and rubbed thoroughly over the diseased part will relieve pain very quickly, and will cause the redness to disappear in two or three days.—Ellingwood's Therap. 1914, v. 8, p. 462.

ALUMINI EXSICCATUM.

Baker, W. L.: Dried alum contained marked quantities of material insoluble in water.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

McCaffrey, J. C.: Of 11 lots of dried and powdered alum examined, 6 exceeded in moisture content our arbitrary limit of 5 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 129.

Patch, E. L.: One lot of dried alum contained a trace of iron, 7 per cent water, and was not clean.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

ALUMINI SULPHAS.

Krantz, L. P.: The use of aluminum sulphate in the chemical purification of water.—Chem. Weekblad, 1914, v. 11, p. 909–910.

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AMMONII BENZOAS.

Hill, C. A.: Of 17 samples of ammonium benzoate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 15 parts per million. The arsenic content varied from 0.4 to 1.6 parts per million.—Chem. & Drug. 1914, v. 85, p. 20.

AMMONII BROMIDUM.

E'we, G. E.: One lot of ammonium bromide was found which contained particles of fine glass, which were not readily detected by the eye, but were easily discernible on dissolving the salt in water.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 129.

Finnemore, Horace: The incompatibility of sodium nitrite and ammonium bromide is due to the formation of ammonium nitrite by double decomposition. This product decomposes into water and nitrogen, the latter being responsible for the occasional bursting of the container.—Brit. M. J. 1914, v. 1, p. 790–791.

Becker, Henry C.: Ammonium bromide is slightly stimulating and most apt to produce acne.—Merck's Arch. 1914, v. 16, p. 35.

Gaskill, Henry Kennedy: Report of a case of bromide eruption simulating blastomycosis or eczema.—J. Am. M. Assoc. 1914, v. 62, p. 912–914.

AMMONII CARBONAS.

Baker, W. L.: Ammonium carbonate was found to be badly decomposed.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Mann, E. W.: It is practically impossible for even the freshly powdered carbonate to comply with the official requirements.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 42.

Orrick, W. H.: Two lots tested were below the U. S. P. standard of 97 per cent, testing 96.4 and 96.3 per cent, but were otherwise U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 129.

Hill, C. A.: Of 178 samples of ammonium carbonate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 125 parts per million. The arsenic content varied from 0 to 0.5 part per million.—Chem. & Drug. 1914, v. 85, p. 20.

Miller, Joseph L.: The clinical value of expectorants. Ammonium carbonate when given in sufficiently large doses to animals increases bronchial secretion.—Am. J. M. Sc. 1914, v. 148, p. 475.

AMMONII CHLORIDUM.

Strommenger, W.: Ammonium chloride; a new by-product in coke and gas works.—Chem. Ztschr. 1914, v. 13, p. 117–119, also Ztschr. ang. Chem. 1914, v. 27, p. 518–519, and Koppers, H.: p. 656.

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Enz, Karl: The testing of ammonium chloride and the difficulties involved in testing for iron.—Apoth.-Ztg. 1914, v. 29, p. 186–187. See also comments by Wiebelitz, p. 194.

Hill, C. A.: Of 165 samples of ammonium chloride examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 8 parts per million. The arsenic content varied from 0 to 0.8 part per million.—Chem. & Drug. 1914, v. 85, p. 20.

Kebler, L. F.: Outline of method for the determination of ammonium chloride in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1084.

Miller, Joseph L.: The clinical value of expectorants. Ammonium chloride when given in sufficiently large doses to animals increases bronchial secretion.—Am. J. M. Sc. 1914, v. 148, p. 475.

AMMONII SALICYLAS.

McMaster, LeRoy: When ammonia gas was passed into an ethereal solution of salicylic acid, white, pearly scales were formed. An aqueous solution of the salt was neutral and produced, with ferric chloride, a wine-red color.—J. Am. Chem. Soc. 1914, v. 36, p. 1921.

Kebler, L. F.: Outline of method for the determination of ammonium salicylate in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1084.

AMYGDALA.

U. S. P. IX: Comprehensive description of the powder to be included. Ash not exceeding 4 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 362, and Abstr. Prop. Changes, Part 2, 1914, p. 4.

Gehe & Co.: A table showing the weight of almonds exported from Italy during the years 1911 to 1913, inclusive.—Handersbericht, 1914, p. 47–49.

Noyes, C. R.: Almond meal compound may contain any percentage of starch, flour, etc., that the manufacturer prefers, or it may be made entirely from these articles and flavored with oil of bitter almonds.—J. Am. Pharm. Assoc. 1914, v. 3, p. 856; also Proc. Minnesota Pharm. Assoc. 1914, p. 193.

AMYLIS NITRIS.

Taylor, Frank O.: Amyl nitrite; its preparation, purity, and tests.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1327–1335, 1466–1473, 1584–1592.

Mann, E. W.: Some specimens of this compound are evidently prepared from insufficiently purified amylic alcohol, and fail to satisfy the official distillation test.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 43.

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Macht, David I.: Action of the nitrites on the isolated surviving pulmonary artery.—J. Am. M. Assoc. 1914, v. 62, p. 524–525. See also J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 23.

J. D. Riedel, A.-G.: A review of some of the recent literature relating to the treatment of epilepsy, migraine, and insomnia by the use of amyl nitrite.—Riedel's Berichte, 1914, p. 53.

AMYLUM.

U. S. P. IX: Taste slight, characteristic. Residue on incineration changed from "not more than 1 per cent" to "not more than 0.5 per cent."—J. Am. Pharm. Assoc. 1914, v. 3, p. 362, and Abstr. Prop. Changes, Part 2, 1914, p. 4.

Wagner, T. B.: The development of the corn-starch industry in the United States.—Tr. Am. Inst. Chem. Eng. 1914, v. 6, p. 3.

Guillermond, A.: On the formation of starch in the embyro before the maturing of the grain.—Compt. rend. Soc. biol. 1914, v. 76, p. 567–573.

Kraemer, Henry: The influence of heat and chemicals on the starch grain.—Am. J. Pharm. 1914, v. 86, p. 81–85.

Harvey, R. B.: The structure and diagnostic value of the starch grain; illustrated.—Lilly Sci. Bull. 1914, Ser. 1, p. 194–198.

Pringsheim and Eissler: Further contribution on the chemistry of starch, with report of experimental work on dextrins and related compounds.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2565–2572.

Kebler, L. F.: Outline of method for the determination of starch in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1081.

Linke, H.: Twenty-seven samples of amylum varied from 0.04 to 0.30 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 501–502.

Chapin, Robert M.: A practical method for the preparation of dry starch, soluble in cold water, for use as an indicator.—J. Ind. & Eng. Chem. 1914, v. 6, p. 649–650.

Daish, A. J.: The action of cold concentrated hydrochloric acid on starch and maltose.—J. Chem. Soc. Lond. 1914, v. 105, p. 2053–2065. See also p. 2065–2073.

Baker and Hulton: The action of diastase on starch granules.—Proc. Chem. Soc. 1914, v. 30, p. 133–134; also J. Chem. Soc. Lond. 1914, v. 105, p. 1529–1536.

Same, Max: On the colloidal changes in starch.—Internat. Ztschr. physikal.-chem. Biol. 1914, v. 1, p. 173–188.

Thomas, A. W.: On the phosphorus content of starch.—Biochem. Bull. 1914, v. 3, p. 403–406.

Alcock, F. H.: Glycerinum amyli was introduced in 1858 by G. F. Schacht, of Clifton.—Chem. & Drug. 1914, v. 84, p. 478.

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Southworth, Thomas S.: The influence of starch on infant digestion.—J. Am. M. Assoc. 1914, v. 63, p. 1377.

For additional references on the chemistry of starch, see Chem. Abstr.; J. Chem. Soc. Lond; and Chem. Zentralbl.

ANISUM.

U. S. P. IX: The dried ripe fruit, with not more than 3 per cent of foreign seeds and other vegetable matter. The drug is described in detail. Ash not exceeding 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 362, and Abstr. Prop. Changes, Part 2, 1914, p. 4.

Alsberg, C. L.: Anise should contain not less than 97 per cent of sound anise seed and not more than 9 per cent of ash.—S. R. A.-Chem. 1914, p. 529; also Drug. Circ. 1914, v. 58, p. 545, and Oil, Paint & Drug Rep. 1914, v. 86, July 27, p. 11.

J. D. Riedel, A.-G.: Anise contained from 5.6 to 9.5 per cent of ash and from 28 to 31.4 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Mann, E. W.: Samples of Russian anise seed were found to contain from 5.90 to 13.10 per cent of ash. Samples of Spanish aniseed were found to contain from 5.63 to 14.66 per cent of ash.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 7.

Jensen, H. R.: Four samples of Russian anise yielded from 8.4 to 10.8 per cent of ash.—Evans's An. Notes, 1914, p. 8.

Plahl, Wilhelm: The detection of extracted anise seed, considerable reliance being placed on the odor and taste with individual seed.—Arch. Chem. Mikros. 1914, v. 7, p. 209–211.

Gehe & Co.: The production of anise in Russia decreased materially during the year 1913, and the oil content of the drug produced was also below the average.—Handelsbericht, 1914, p. 77. See also Schimmel & Co. Semi-Ann. Rep. April, 1914, p. 31; and Rev. internat. pharm. Brux. 1914, v. 2, p. 70–73.

ANTHEMIS.

Power and Browning, jr.: The constituents of the flowers of *Anthemis nobilis*.—J. Chem. Soc. Lond. 1914, v. 105, p. 1829–1845.

Mann, E. W.: The specific gravity of the Ph. Brit. for oil of chamomile is too low. The figure for a sample of authentic oil of English distillation was 0.919, with refractive index, 1.4441.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 30.

Jensen, H. R.: Two genuine samples of English chamomile oil had: Specific gravity, 0.9045 and 0.9052; refractive index, 1.4437 and 1.443; saponification value, 294 and 289.3; acid value, 3.5 and 1.7.—Evans's An. Notes, 1914, p. 22.

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ANTIMONII ET POTASSII TARTRAS.

Anon.: Antimony: Its rise and fall as a medicinal agent. A review of some of the history.—Nat. Druggist, 1914, v. 44, p. 109.

Häussler, E. P.: The determination of antimony and potassium tartrate by the method of Halenke and Möslinger.—Pharm. Zentralh. 1914, v. 55, p. 797; also Pharm. Ztg. 1914, v. 59, p. 401.

Jensen, H. R.: Nine samples of antimony and potassium tartrate were found to contain from 98.2 to 98.8 per cent of anhydrous salt.—Evans's An. Notes, 1914, p. 9.

McWalter, J. C.: Antimony in syphilis.—Brit. M. J. 1914, v. 2, p. 623–624.

Liesching, C. E.: Antimony in pneumonia.—Brit. M. J. 1914, v. 1, p. 914.

Anon.: The efficacy of tartar emetic in superficial leishmaniosis.—J. Am. M. Assoc. 1914, v. 63, p. 1051.

Morgan, Gilbert T.: Organic derivatives of arsenic and antimony.—Pharm. J. 1914, v. 92, p. 537–540, 567–571.

ANTIMONIUM SULPHURATUM, N. F.

Rupp, E.: A modified method for the determination of antimony in sulphuretted antimony.—Südd. Apoth.-Ztg. 1914, v. 54, p. 322; also Apoth.-Ztg. 1914, v. 29, p. 724.

Lehmann and Berdau: The testing of antimony sulphide with a table showing the results obtained in connection with a number of samples.—Apoth.-Ztg. 1914, v. 29, p. 186–187.

Mann, E. W.: Several samples of commercial black antimony have given fairly satisfactory figures. The maximum amount of silicious matter found was but 2.2 per cent, and for arsenic, 1,000 parts per million.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 43.

ANTIPYRINA.

Williams, Joseph H.: The manufacture of antipyrine.—Pharm. J. 1914, v. 93, p. 293. See also Anon.: Chem. & Drug. 1914, v. 85, p. 273; and Southern Pharm. J. 1914, v. 7, p. 59.

Fernau, Albert: A test for reducing substances in antipyrine is needed.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 228.

Emery and Palkin: The estimation of antipyrine. Description of the methods employed, and table showing the results obtained.—J. Ind. & Eng. Chem. 1914, v. 6, p. 751–753.

Kebler, L. F.: Outline of method for the determination of antipyrine in compressed tablets.—J. Am. Pharm Assoc. 1914, v. 3, p. 1087.

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Kollo, Konstantin: Ampoules of antipyrine may be sterilized for 20 minutes at 110° or for 30 minutes at 105°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Mannich, C.: Incompatibility of hexamethylenamine and antipyrine.—Pharm. Post, 1914, v. 47, p. 538. Also Merck's Rep. 1914, v. 23, p. 278.

Anon.: Antipyrine and aspirin should not be mixed together. The acetic ester will be split off and keep the powder moist.—Am. Druggist, 1914, v. 62, p. 93.

Isenschmid, R.: Experimental observations on the action of antipyrine on body temperature of animals without thermo regulation.—Arch. exper. Path. u. Pharm. 1914, v. 75, p. 10–32.

Simpson, Maxwell S.: Of all the antispasmodics antipyrine was most successfully employed in the treatment of whooping cough.—Merck's Arch. 1914, v. 16, p. 388.

APIOL.

Roberts, J. G.: Considerable confusion exists in regard to the purity standards for apiol.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 129.

Mann, E. W.: Commercial apiol is, in our experience, a very variable substance.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 28.

Jensen, H. R.: Three pure samples of apiol gave: Specific gravity, from 1.096 to 1.121; refractive index, 1.525 to 1.536; saponification value, 13.7 to 42.2; iodine value, 207.5 to 221.2.—Evans's An. Notes, 1914, p. 9.

Brenot, M.: A fatal case of poisoning by apiol in a young woman of 25, who, at one time, took 14 capsules of apiol. Severe symptoms were developed three days later.—Schweiz. Apoth.—Ztg. 1914, v. 52, p. 6–7.

Celery Seed.—U. S. P. IX: The dried ripe fruit of *Petroselinum sativum* with not more than 5 per cent of foreign seeds and other vegetable matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 393, and Abstr. Prop. Changes, Part 2, 1914, p. 35.

Alsberg, C. L.: Celery seed should contain not less than 90 per cent of sound celery seed and not more than 10 per cent of ash.—S. R. A.-Chem. 1914, p. 529; also Drug. Circ. 1914, v. 58, p. 545.

Schimmel & Co.: The price of celery seed has been out of all proportion to the cheap offers for celery oil by the French producers.—Schimmel & Co. Semi-Ann. Rep. April, 1914, p. 43.

APOCYNUM.

U. S. P. IX: Restricted to the dried rhizome and roots of *Apocynum cannabinum* Linné. Description designed to facilitate the de-

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tection of other species.—J. Am. Pharm. Assoc. 1914, v. 3, p. 362, and Abstr. Prop. Changes, Part 2, 1914, p. 4.

Lilly, J. K.: Several species of apocynum other than cannabinum are regularly collected and marketed for apocynum.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Anon.: A new active principle of Canadian hemp.—Am. Druggist, 1914, v. 62, p. 454.

Mundy, W. N.: Apocynum is a sovereign remedy in cardiac dropsy.—Ellingwood's Therap. 1914, v. 8, p. 362.

Morrow, Thomas L.: Apocynum is a useful remedy in the treatment of acute alcoholism.—Ellingwood's Therap. 1914, v. 8, p. 134.

APOMORPHINÆ HYDROCHLORIDUM.

Dott, D. B.: Note on the formation of apomorphine from morphine by the action of hydrochloric acid.—Pharm. J. 1914, v. 92, p. 164. For discussion see p. 185; also Chem. & Drug. 1914, v. 84, p. 239.

Fernau, Albert: A test for chloromorphine should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 228.

Kollo, Konstantin: Ampoules of apomorphine hydrochloride should be prepared in sterile apparatus with acetic acid in place of hydrochloric acid.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Miller, Joseph L.: The clinical value of expectorants. Apomorphine when given in sufficiently large doses to animals increases bronchial secretion.—Am. J. M. Sc. 1914, v. 148, p. 475.

Braun, Israel: Apomorphine, hypodermically, is a very useful remedy in bronchial asthma.—Merck's Arch. 1914, v. 16, p. 107.

AQUA.

U. S. P. IX: To require that water be practically tasteless and odorless. Solids now limited to 0.03 gm. in 100 cc. Modified tests for heavy metals and a new test for limit of coloration.—J. Am. Pharm. Assoc. 1914, v. 3, p. 524, and Abstr. Prop. Changes, Part 3, 1914, p. 1.

Becker, I. A.: The proposed tests for iron in water establishes a much less rigid standard than the present U. S. P. heavy metal test.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1023; also Nat. Druggist, 1914, v. 44, p. 419.

Bahlmann, Clarence: The determination of hardness in natural waters.—J. Ind. & Eng. Chem. 1914, v. 6, p. 209–211. See also Winkler, L. W.: Ztschr. Anal. Chem. 1914, v. 53, p. 409–415; and Nockmann, Else: Pharm. Zentralh. 1914, v. 55, p. 435–437.

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Gawalowski, Anton C. W.: Comparative examination of the methods for determining the degree of hardness of water.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 722–726.

Marasugeff, N. P.: Determining the degree of opacity of water.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 798–800.

Winkler, L. W.: On the determination of the chlorine ion in natural waters.—Ztschr. Anal. Chem. 1914, v. 53, p. 359–362.

Miller, James: A field method for determining dissolved oxygen in water.—J. Soc. Chem. Ind. 1914, v. 33, p. 185–186.

Winkler, L. W.: On the determination of free carbon dioxide in potable and other waters.—Ztschr. Anal. Chem. 1914, v. 53, p. 746–755.

Mayer, Otto: The determination of iron in natural waters.—Pharm. Ztg. 1914, v. 59, p. 422.

Lührig, H.: The colorimetric determination of minute quantities of manganese in water.—Chem.-Ztg. 1914, v. 38, p. 781–783.

Pick, H.: The determination of minute quantities of lead in water supplies.—Arb. k. Gsndhtsamte, 1914, v. 48, p. 155–164.

Kay, Percy: Estimation of organic matter in water.—Chem. News, 1914, v. 110, p. 13.

Froboese, Victor: Contribution on water analysis. The rapid determination of magnesium by titration in the presence of calcium.—Ztschr. Anorg. Chem. 1914, v. 89, p. 370–376.

Soper, George A.: A book review of a volume entitled "Review of the Examination of Water and Water Supplies," by John C. Thresh. Second edition.—J. Ind. & Eng. Chem. 1914, v. 6, p. 176.

Winslow, C.-E. A.: A book review of a volume on the microscopy of drinking water by George Chandler Whipple.—Science, 1914, v. 40, p. 448–450.

Winslow, C.-E. A.: A book review of a volume on the bacteriological examination of food and water, by W. G. Savage.—Science, 1914, v. 40, p. 715.

Editorial: Bacteriologic standards for drinking water. A comment on the report of the commission appointed by the Secretary of the Treasury.—J. Am. M. Assoc. 1914, v. 63, p. 2294–2295. See also Public Health Rep. 1914, v. 29, p. 2951–2966.

Cram and Evans: Purification of water by adsorption. Preliminary announcement.—J. Ind. & Eng. Chem. 1914, v. 6, p. 166.

Charitschkoff, K.: The sterilization of water by means of filtration.—Chem.-Ztg. 1914, v. 38, p. 222.

von Recklinghausen, M.: The ultra-violet rays and their application for the sterilization of water. Illustrated description of a lamp and other apparatus used.—J. Frankl. Inst. 1914, v. 178, p. 681–704.

Phelps, Earle B.: The chemical disinfection of water. Illustrated descriptions of methods for regulating the dose.—Public Health Rep. 1914, v. 29, p. 2709–2715.

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Steffenhagen, Karl: A review of the available literature on the treatment of water by means of chlorinated lime.—Hyg. Rundschau, 1914, v. 24, p. 185–208.

Vosmaer, A.: The purification of water. Observations on the use of chlorinated lime.—Chem. Weekblad, 1914, v. 11, p. 927–930. See also p. 837–842.

Thomas, Stanley Judson: The hypochlorite of lime treatment of a municipal water supply.—J. Ind. & Eng. Chem. 1914, v. 6, p. 548–552. See also Thomas and Sandman, p. 637–639.

Krantz, L. P.: The purification of water by chemical means. The use of aluminum sulphate.—Chem. Weekblad, 1914, v. 11, p. 909–910.

Bohlig and Roth: The purification of water by means of magnesium.—Chem.-Ztg. 1914, v. 38, p. 859–860.

Pryer, R. W.: Water purification by ozone, with report on the Ann Arbor plant.—J. Ind. & Eng. Chem. 1914, v. 6, p. 797–800.

Rohland, P.: The colloidal clay method of purifying waste waters.—Seifensieder Ztg. 1914, v. 41, p. 310–311. See also p. 1210–1211.

Geyser, Albert C.: The therapeutic uses of water; a review.—Am. Med. 1914, v. 20, p. 103–106.

For additional references see Index Med.; Zentralbl. Exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

AQUÆ.

U. S. P. IX: An abstract of the proposed changes in the formulas and standards for the official waters.—J. Am. Pharm. Assoc. 1914, v. 3, p. 524–526, and Abstr. Prop. Changes, part 3, 1914, p. 1–3.

Llewellyn, H. D.: It is recommended that the waters containing volatile substances be retained in their present formulas, strength, and method of preparation.—Proc. Missouri Pharm. Assoc. 1914, p. 141.

Rhode, R. E.: Aromatic waters should be made with magnesia instead of talcum. Recently boiled water may lead to better preparations.—J. Am. Pharm. Assoc. 1914, v. 3, p. 901.

Mittelbach, Wm.: The use of recently boiled distilled water in the preparation of the official waters seems a good improvement and will add to the keeping qualities of these preparations.—Proc. Missouri Pharm. Assoc. 1914, p. 106.

Becker, I. A.: The requirement that recently boiled distilled water be used in the making of medicated waters is considered unnecessary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1024.

Curry, Gordon L.: Of the 19 official waters, 12 can be advantageously prepared in the retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 56.

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AQUA AMMONIÆ.

U. S. P. IX: Rubric to read not less than 9.5 nor more than 10.5 per cent by weight of ammonia. Specific gravity to read about 0.958 at 25°. Residue on volatilization not to exceed 0.02 per cent when evaporated in a platinum dish at 120°, from 25 cc. of ammonia water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, part 3, 1914, p. 2.

For patents on the manufacture of ammonia see J. Soc. Chem. Ind. 1914, v. 33, p. 485, 593, 750.

Bagley, D.: A further contribution to the history of the direct production of ammonia.—Ztschr. ang. Chem. 1914, v. 27, p. 378–383. See also Haber, F., p. 473–477, and Ohnesorge, Otto, p. 525–527.

Serpek, O.: The inorganic synthesis of ammonia.—Ztschr. ang. Chem. 1914, v. 27, p. 41–48.

Dieffenbach, O.: The conversion of ammonia to nitric acid and ammonium nitrate from a commercial point of view.—Chem. Ind. 1914, v. 37, p. 265–269.

Oesterheld, G.: The electrochemical oxidation of ammonia.—Ztschr. anorg. Chem. 1914, v. 86, p. 105–142.

Anon.: Water of ammonia is frequently ordered as 3 f or 4 f. For 3 f the 10 per cent or 16° Baumé product is supplied. The 4 f ammonia contains 17 per cent of gas and is 20° Baumé.—Meyer Bros. Drug. 1914, v. 25, p. 202.

Fernau, Albert: As an indicator for the titration of aqua ammoniæ, methyl orange is preferred.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 228.

Goerlich, G.: The detection of empyreumatic contaminations in ammonia water.—Pharm. Ztg. 1914, v. 59, p. 460–461, 472–473.

Haber, F.: A report on seven examinations of ammonia made in recent years for the purpose of determining the thermic and chemical behavior of ammonia.—Ztschr. Elektrochem. 1914, v. 20, p. 597–604.

Snell, J. F.: Commercial household ammonia in Canada.—J. Soc. Chem. Ind. 1914, v. 33, p. 1177–1178.

Richter, Ernst: Aqua ammoniæ did not comply with the hydrogen sulphide test.—Apoth.-Ztg. 1914, v. 29, p. 211.

Table showing some of the analytical results reported for ammonia water.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	4	4	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, Lucius P.	31	28	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Ewe, G. E.	27	3	Proc. Pennsylvania Pharm. Assoc. 1914, p. 129.
Woods, Chas. D.	14	11	Off. Insp. Maine Agric. Exper. Sta. 1913, 1914, No. 48, p. 22–23.

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AQUA AMMONII FORTIOR.

U. S. P. IX: Rubric to read not less than 27 nor more than 29 per cent by weight of ammonia. Specific gravity about 0.897 at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, part 3, 1914, p. 2.

White, Wm. R.: A method of handling stronger ammonia water, based on the principle of a siphon started by compressed air.—J. Am. Pharm. Assoc. 1914, v. 3, p. 506–507.

Hill, C. A.: Of 46 samples of solution of stronger ammonia examined during the years 1911 to 1913, inclusive, the lead content varied from 0 to 17. The arsenic content varied from 0 to 0.3 part per million.—Chem. & Drug. 1914, v. 85, p. 21.

E'we, G. E.: Of 10 lots of stronger ammonia water examined, 3 were slightly below the required 28 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 129.

Williams, Ed. E.: Commercially, stronger ammonia water always tests about 26 per cent. If impracticable to manufacture 28 per cent, the standard should be lowered; if not, the manufacturers should be made to conform to it.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

AQUA AURANTII FLORUM FORTIOR.

U. S. P. IX: To be free from empyreuma, mustiness, and mucilaginous growths. Should be neutral or show only a slightly acid reaction to litmus and leave no residue on evaporation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, Part 3, 1914, p. 2.

AQUA DESTILLATA.

U. S. P. IX: Amount of distillate collected to read 750 volumes. Any kind of still may be used if the water complies with the tests given. Modified tests for heavy metals, for ammonia, and for oxidizable substances.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, Part 3, 1914, p. 2.

Murphy, J. V.: Preservation of distilled water. A description of an efficient container designed to prevent contamination with dust or organisms.—Pract. Drug. 1914, v. 32, p. 447.

Barladean, A. G.: The testing of distilled water for purity.—Pharm. Zentralh. 1914, v. 55, p. 115–121. See also Schweiz. Apoth.-Ztg. 1914, v. 52, p. 205–209, and p. 369–371.

Mann, E. W.: Absolute purity in waters is unattainable even under the most rigid precautions. The comparative purity must be judged by the standard of the use to which it is to be put.—Chem. & Drug. 1914, v. 84, p. 672–673.

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Raubenheimer, Otto: Pharmacists should know that distilled water is not necessarily sterile water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 799.

Reach, Franz: The nature, number, and kind of bacteria found in distilled water, with a practical method for avoiding the infection of distilled water.—Pharm. Post, 1914, v. 47, p. 279–280.

Wischo, Fritz: The preparation of distilled water to be used in the making of physiological salt solution and in salvarsan injections.—Pharm. Post, 1914, v. 47, p. 145–151; also Pharm. Zentralh. 1914, v. 55, p. 585–587.

Frary, Guy G.: One sample of distilled water examined; solids excessive.—Rep. South Dakota, F. & D. Com. 1914, p. 255.

Ziefle, Adolph: Of 65 samples of distilled water examined, only 6 samples were entirely free from sediment. Eleven of the samples gave a distinct reaction with litmus paper.—Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 141–143.

AQUA HYDROGENII DIOXIDI.

U. S. P. IX: To permit the use of not exceeding 0.4 gm. of acetanilide to each 1,000 cc. as a preservative. Discolored or odorous solutions should not be used. Tests modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 529, and Abstr. Prop. Changes, Part 3, 1914, p. 6.

Anon.: Oxygenated water (hydrogen peroxide) was discovered by Louis Jacques Thénard in 1818.—Pharm. Era, 1914, v. 47, p. 155–156.

Wilbert, M. I.: The title "Solution of hydrogen dioxide" has been severely criticized by chemists, who point out that dioxide is used to designate certain definite combinations, like manganese dioxide, and is not applicable to a peroxide such as exists in the official solution.—J. Am. Pharm. Assoc. 1914, v. 3, p. 655.

White, J. Stanley: Hydrogen peroxide solution. A review of the official requirements for solution of hydrogen peroxide and the preservation of the preparation by means of acetanilide.—Pharm. Era, 1914, v. 47, p. 263.

Schaidhauf, A.: U. S. Patent 1,109,791. A neutral solution of hydrogen peroxide is rendered stable by the addition of soap.—J. Ind. & Eng. Chem. 1914, v. 6, p. 1050.

Wagner, Hans: A recent patent provides for the production of hydrogen peroxide from electrolytically produced potassium.—Südd. Apoth.-Ztg. 1914, v. 54, p. 627.

Wolf, Paul Max: On the synthesis of 100 per cent hydrogen peroxide by means of the silent electrical discharge.—Ztschr. Elektrochem. 1914, v. 20, p. 204–219.

Pietzsch and Adolph: Process of producing hydrogen peroxide.—J. Soc. Chem. Ind. 1914, v. 33, p. 200. See also patents, p. 353, 544, 693, 750, 1009.

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Fernau, Albert: A limitation for residue and a test for barium and for arsenic should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Sperber, Joachim: The displacement of acids by hydrogen dioxide.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 2–6, 245–248. See also Apoth.-Ztg. 1914, v. 29, p. 69; and O. R., p. 685–686.

Marden, J. W.: A modified method for determining acetanilide in hydrogen peroxide by shaking out with chloroform.—J. Ind. & Eng. Chem. 1914, v. 6, p. 315–318.

Kirby, William: Hydrogen peroxide preserved by acetanilide.—Pharm. J. 1914, v. 92, p. 274–275. See also Stewart, R., p. 353; Finnemore, H., p. 421–422; and Timolat, J. P., p. 746.

Gane, E. H.: A score of makers of peroxide have each been claiming to be the original discoverers of this excellent method of preserving hydrogen peroxide solutions.—Pharm. J. 1914, v. 92, p. 698.

E'we and Vanderkleed: The use of more acetanilide than three-sixteenths grain per fluid ounce does not prevent a gradual deterioration of the solution, and is objectionable because it greatly increases the acidity and color.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 276.

Murray, B. L.: Note on the acidity of hydrogen peroxide solution, with outline of method for the quantitative determination of free acid present.—J. Am. Pharm. Assoc. 1914, v. 3, p. 650; also Pract. Drug. 1914, v. 32, p. 498.

Lefeldt, M.: The Ph. Germ. V. test for barium salts in hydrogen peroxide could be improved.—Pharm. Ztg. 1914, v. 59, p. 42.

White, J. Stanley: Hydrogen peroxide solution. The differences in strength met with in commercial samples.—Pharm. J. 1914, v. 92, p. 536–537.

Table showing some of the analytical results reported for solution of hydrogen peroxide.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E	10	2	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, L. A	6	3	Proc. Kentucky Pharm. Assoc. 1914, p. 119.
Brown, Lucius P	17	3	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Committee on drug adulteration.	8	1	Proc. Missouri Pharm. Assoc. 1914, p. 104.
Congdon, Leon A	6	3	Rep. Kansas Bd. Health, 1914, p. 100.
Jackson, Cook, and Strickland	30	6	Rep. Rhode Island F. & D. Com. 1914, p. 15.
Linke, H	22	1	Apoth.-Ztg. 1914, v. 29, p. 684.
Lythgoe, Hermann C	3	0	Rep. Massachusetts Bd. Health, 1913, 1914, p. 498.
Marquier, Adolph F	10	1	Proc. New Jersey Pharm. Assoc. 1914, p. 110.
Newcomb, George D	11	0	Proc. Iowa Pharm. Assoc. 1914, p. 28.
Stadtmueller, F. H	32	4	Rep. Connecticut D. & F. Com. 1914, p. 15.
Strode, Sylvanus E	14	5	Rep. Ohio D. & F. Div. 1914, p. 119.
Sudro, W. F	80	15	Rep. North Dakota Exper. Sta. Rec. 1912, 1914, p. 169–172.
Todd, A. R	3	1	Rep. Michigan D. & F. Com. 1914, p. 167.

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Eicholz, W.: The action of hydrogen peroxide on metals and its application for the disinfection of instruments under conditions in which sterilization by heat can not be employed.—Apoth.-Ztg. 1914, v. 29, p. 11.

Mathews and Curtis: The photochemical decomposition of hydrogen peroxide.—J. Phys. Chem. 1914, v. 18, p. 166–178, 521–537.

Walther: The use of hydrogen peroxide or of its preparations in the treatment of wounds.—Münch. med. Wchnschr. 1914, v. 61, p. 2185–2186.

For additional references on hydrogen peroxide see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

AQUA ROSÆ FORTIOR.

U. S. P. IX: Required to be free from mustiness and mucilaginous growths. Should be neutral or only slightly acid with litmus.—J. Am. Pharm. Assoc. 1914, v. 3, p. 526, and Abstr. Prop. Changes, Part 3, 1914, p. 3.

ARGENTI NITRAS.

Stockinger, R.: Practically all silver nitrate becomes fairly dark on the surface and in some cases gives opalescent, faintly colored solution of halogen-free water after heating at 130°, for one hour, in covered porcelain crucible, as directed by the U. S. P., in preparation of deci-normal silver nitrate solution.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 156.

Gibbons and Getman: The potential of silver in nonaqueous solutions of silver nitrate. Report of experimental observations, accompanied by a chronological bibliography.—J. Am. Chem. Soc. 1914, v. 36, p. 1630–1655.

Apple, Franklin M.: A mixture of 1 part hard paraffin and 5 parts petrolatum was found to give the best results as an excipient for pills of silver nitrate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 231–232.

Lublinski, W.: Therapeutically silver nitrate is considered to be superior to all other silver salts.—Berl. klin. Wchnschr. 1914, v. 51, p. 1643; also J. Am. M. Assoc. 1914, v. 63, p. 1610.

ARGENTUM (COLLOIDAL SILVER).

Anon.: Under the title Argentum colloidale, with synonym collargol, it is proposed to add to the Ph. Norv. IV a colloidal silver containing a trace of albumin.—Pharm. Weekblad, 1914, v. 51, p. 72–73.

Bohrisch, P.: The Ph. Germ. should include a method of assay for determining the silver content of colloidal silver.—Apoth.-Ztg. 1914, v. 29, p. 901; also Pharm. Zentralh. 1914, v. 55, p. 892.

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Schmiedel: Commercial samples of colloidal silver vary considerably in their silver content.—Südd. Apoth.-Ztg. 1914, v. 54, p. 364–365.

Long, S. H.: Some properties of electrolytically produced colloidal silver.—Kolloid-Ztschr. 1914, v. 14, p. 136–139.

Rebière, G.: A review of our knowledge relating to colloidal solutions and a general discussion of the properties of colloidal solutions.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 251, 314, 393.

Rupp, E.: The valuation of commercial preparations of colloidal silver involves the quantitative determination of silver content.—Südd. Apoth.-Ztg. 1914, v. 54, p. 302; also Apoth.-Ztg. 1914, v. 29, p. 723.

Warnecke, G.: The determination of the silver in silver proteinate and colloidal silver.—Apoth-Ztg. 1914, v. 29, p. 943–944.

Lehmann, F.: A simple method for the valuation of colloidal silver.—Arch. Pharm. 1914, v. 252, p. 9–12. See also Dankwortt, P. W., p. 69–76; also p. 497–501; and Korndörfer, A., Apoth.-Ztg. 1914, v. 29, p. 901.

Voigt, J.: A study on the distribution and the fate of colloidal silver in the mammalian body.—Biochem. Ztschr. 1914, v. 63, p. 409–424. See correction, p. 497. See also Therap. Monatsh. 1914, v. 28, p. 625–629.

Kollo, Konstantin: Ampoules of colloidal silver should be prepared in a sterile apparatus.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Crispin, Antonio M.: A case of argyrism following the use of collargol.—J. Am. M. Assoc. 1914, v. 62, p. 1394.

Crowell, Andrew J.: Collargol in pyelography, with a report of an interesting case and a note on a number of experiments on dogs.—J. Am. M. Assoc. 1914, v. 63, p. 1387–1389.

Eisendrath, Daniel E.: A preliminary note on the effect of injecting collargol into the renal pelvis.—J. Am. M. Assoc. 1914, v. 62, p. 1392–1393.

Vest, C. W.: Collargol should be used in pyelography only when absolutely necessary.—J. H. Hosp. Bull. 1914, v. 25, p. 74–77; also J. Am. M. Assoc. 1914, v. 62, p. 1120.

Rae, James: The clinical uses of colloidal metals.—Brit. M. J. 1914, v. 1, p. 1016.

Simpson and Hewlett: Experiments on the germicidal action of colloidal silver.—Lancet, 1914, v. 187, p. 1386.

ARGENTUM (SILVER PROTEINATE).

Anon.: Under the title argentum proteinicum it is proposed to add to the Ph. Norv. IV an albumin combination, containing from 8 to 9 per cent of silver.—Pharm. Weekblad, 1914, v. 51, p. 73–74.

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Rupp, E.: The Ph. Germ. method for determining the silver content of protein compounds is not always satisfactory. A modified method is outlined.—Südd. Apoth.-Ztg. 1914, v. 54, p. 302; also Apoth.-Ztg. 1914, v. 29, p. 723.

Gehe & Co.: The Ph. Germ. V directions for determining foreign silver salts may lead to error, as even a good preparation is slightly soluble in alcohol.—Pharm. Zentralh. 1914, v. 55, p. 400.

Stöcker: The quantitative determination of silver in silver proteinate and similar preparations. Method designed to avoid incineration.—Apoth.-Ztg. 1914, v. 29, p. 344–345. See also Warnecke, G., p. 943–944.

Kroeber, Ludwig: Further observations on the composition of commercial preparations of silver proteinate. Eight samples were found to contain from 4.99 to 9.2 per cent of silver and from 6.97 to 12.03 per cent of moisture.—Apoth.-Ztg. 1914, v. 29, p. 713–715.

ARNICA.

Rippetoe, J. R.: Two samples of arnica flowers were found to contain 20.81 and 24.25 per cent of alcohol (49 per cent) extract and 7.78 and 6.80 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 436.

J. D. Riedel, A.-G.: Arnica contained from 6.2 to 8.6 per cent of ash, and from 24.9 to 28.2 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

U. S. P. IX: The tincture is to be made by percolation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 545, and Abstr. Prop. Changes, Part 3, 1914, p. 22.

Anselmino, O.: Report on a number of experiments to determine the relative specific gravity and extract content of tincture of arnica made from drug containing varying amounts of moisture.—Arb. Pharm. Inst. Univ. Berl. 1914, p. 28–29.

Editorial: Arnica is a good remedy to prescribe internally for those engaged in very violent physical exercise.—Ellingwood's Therap. 1914, v. 8, p. 196.

Smith, William A.: The use of arnica internally for ecchymosis. Report of one case in which the remedy "certainly did the job well."—Ellingwood's Therap. 1914, v. 8, p. 134.

ARSENI TRIOXIDUM.

News Note: The output of arsenic in the United States during 1913, was all in the form of white arsenic or arsenious oxide, commonly known as "arsenic," and amounted to about 2,375 short tons.—Oil, Paint & Drug Rep. 1914, v. 85, January 5, p. 58.

Fernau, Albert: An ash content of 0.2 per cent should be permitted in the Ph. Austr.—Ztschr. österr. Apoth.-Ver. 1914, v. 52, p. 227.

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Stockinger, R.: Nine lots of arsenic trioxide, out of 15 examined, were slightly below the U. S. P. standard of 99.8 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 130.

U. S. P. IX: Rubric for solution of arsenious acid to require arsenous acid corresponding to not less than 0.75 and not more than 1.025 per cent of arsenic trioxide. Specific gravity about 1.025 at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 527, and Abstr. Prop. Changes, Part 3, 1914, p. 4.

Brown, Linwood A.: The determination of total arsenic in Fowler's solution and the determination of arsenous arsenic.—J. Am. Pharm. Assoc. 1914, v. 3, p. 645.

Simonot, M. E.: The principal methods for the integral destruction of organic matters in the toxicologic estimation of arsenic.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 101–115.

Dutcher and Steel: The elimination and retention of arsenic as determined by the Koch-Norton method.—J. Am. Chem. Soc. 1914, v. 36, p. 770–773.

Hellwig, Albert: Case of originally unsuspected arsenic poisoning.—Vrtljschr. ger. Med. 1914, v. 48, p. 226–232. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 51.

Harding, H. G. A.: The toleration of arsenic by the human system. Report of experimental observations.—Lancet, 1914, v. 186, p. 241.

Editorial: Arsenic eaters. The supposed beneficient results of arsenic eating.—Med. Rec. 1914, v. 86, p. 1011.

Dyer, Isadore: The use of arsenic and of preparations containing arsenic in the treatment of pellagra.—Merck's Arch. 1914, v. 16, p. 254–255.

ARSENIC (NONOFFICIAL COMPOUNDS).

Morgan, Gilbert T.: Organic derivatives of arsenic and antimony.—Pharm. J. 1914, v. 92, p. 537–540, 567–571.

Fischer, Emil: A new class of aliphatic arsenic combinations.—Ann. Chem. 1914, v. 403, p. 106–117.

Brunor, Emile: Notes on a new organic arsenic preparation; a review.—Am. Med. 1914, v. 20, p. 475–484.

Steinebach, Richard: A contribution to our knowledge of the disturbances of vision produced by atoxyl.—Berl. klin. Wchnschr. 1914, v. 51, p. 1116–1117. See also Makrocki, p. 1765–1766.

J. D. Riedel, A.-G.: A review of some of the recent literature relating to the use of various combinations of arsenic, including salvarsan and neosalvarsan.—Riedel's Berichte, 1914, p. 56–58.

For additional comments on organic combinations of arsenic see Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.; Index Med.; J. Am. M. Assoc.

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Neosalvarsan.—Gutherie, Douglas J.: Note on a simple and rapid method of administering neosalvarsan.—Lancet, 1914, v. 186, p. 242. See also Geiringer, David: J. Am. M. Assoc. 1914, v. 62, p. 454.

Beeson, B. Barker: The initial dose of neosalvarsan in most cases should not exceed 0.45 gm. Distilled water is the best solvent. The intravenous method is one of choice.—J. Am. M. Assoc. 1914, v. 62, p. 510.

Kersten, H. E.: The intramuscular injection of neosalvarsan.—Münch. med. Wchnschr. 1914, v. 61, p. 1172–1173.

Abelin, J.: The behavior of neosalvarsan and salvarsan in the organism, with tables showing the results of observations.—Arch. exper. Path. u. Pharmakol. 1914, v. 75, p. 317–332.

Thomas and Moorhead: Severe cutaneous eruption following neosalvarsan. Report of two cases—J. Am. M. Assoc. 1914, v. 62, p. 608. See also Sheldon, J. H.: Lancet, 1914, v. 187, p. 96.

Gordon, Alfred: Unfavorable complications following an intradural injection of neosalvarsan.—J. Am. M. Assoc. 1914, v. 63, p. 1851.

Neumayer, Victor L.: Case of death following the injection of neosalvarsan.—Münch. med. Wchnschr. 1914, v. 61, p. 824–825.

Editorial: Comment on deaths following injections of neosalvarsan in Los Angeles.—J. Am. M. Assoc. 1914, v. 62, p. 935–936. See also p. 957–958.

Salvarsan.—Thoms, H.: The dispensing of salvarsan. Illustrated description of the method employed.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 211–224.

Eichel, Henry: A self-retaining needle for administering salvarsan intravenously.—J. Am. M. Assoc. 1914, v. 63, p. 1029–1030.

Anon.: The salvarsan patents in England.—Brit. M. J. 1914, v. 2, p. 774–775.

McAdams, P. S.: The effect of "606" on the eye, with the report of seven cases of serious eye complications following its use.—Boston M. & S. J. 1914, v. 170, p. 308–312.

Stühmer, A.: Observations on the use of salvarsan serum.—Münch. med. Wchnschr. 1914, v. 61, p. 745–747. See also Eskuchen, Karl, p. 747–750.

Wechselmann, Wilhelm: The treatment of syphilis with salvarsan alone. A review.—Berl. klin. Wchnschr. 1914, v. 51, p. 533–538.

Jacobsohn, Leo: The salvarsan debate in the Berlin Medical Society.—Therap. Gegenw. 1914, v. 55, p. 176–177, 266–268.

Gennerich and others: A symposium on the use of salvarsan for the sixtieth birthday of Paul Ehrlich, March 14, 1914.—Münch. med. Wchnschr. 1914, v. 61, p. 513–522, 525, 530, 532, 539, 541.

Campbell, Harry: Intrathecal treatment with salvarsanized serum.—Lancet, 1914, v. 186, p. 1648–1649. See also Spencer, Gordon W., p. 1531–1533; and Monrad-Krohn, G. H., v. 187, p. 61–62.

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Ayer, James B.: Salvarsanized serum "Swift-Ellis treatment") in syphilitic diseases of the central nervous system.—Boston M. & S. J. 1914, v. 170, p. 452–461. See also Litterer, William: J. Am. M. Assoc. 1914, v. 63, p. 1878; and Marinesco and Minea: Compt. rend. Soc. biol. 1914, v. 76, p. 672–674.

Buberl, Leonhard: The salvarsan treatment of anthrax carbuncle.—Münch. med. Wchnschr. 1914, v. 61, p. 1340–1341.

Kaempfer, Louis G.: Salvarsan in rhinoscleroma.—New York M. J. 1914, v. 99. p. 636–638.

Kurt, Kall: On the use of small doses of salvarsan in secondary anemia and in metabolic disturbances.—Münch. med. Wchnschr. 1914, v. 61, p. 1506–1508.

Glaser, F.: Salvarsan infusions in scarlet fever.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1760–1761.

Kromayer: The failure in the salvarsan treatment of syphilis.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1736.

Lube, F.: A case of death from acute arsenic poisoning after the injection of salvarsan in a nonluetic.—Deutsch. med. Wchnschr. 1914, v. 40, p. 946–949.

Luithlen, F.: The dangers of salvarsan therapy.—Therap. Monatsh. 1914, v. 28, p. 8–23.

Kohrs, Theodor: An additional case of death from acute encephalitis after the injection of salvarsan.—Münch. med Wchnschr. 1914, v. 61, p. 368–369.

Kanngiesser, Friedrich: A review of the reported untoward results from the use of salvarsan.—J. Pharm. Elsass-Lothr. 1914, v. 41, p. 24–27, and p. 107–110.

Wechselmann, Wilhelm: Critical comments on the pathogenesis of a death by salvarsan.—Münch. med. Wchnschr. 1914, v. 61, p. 1845–1846.

Schmitt, Artur: A review of the reported deaths from salvarsan and other causes, with particular consideration of the injury done by salvarsan.—Münch. med. Wchnschr. 1914, v. 61, p. 1337–1340, 1396–1399; also Pharm. Ztg. 1914, v. 29, p. 510.

Book Review: The encyclopedic volume by Victor Mentberger contains over 3,000 references to literature, and describes over 350 fatalities following the use of salvarsan and neosalvarsan.—New York M. J. 1914, v. 99, p. 906.

For additional references see Index Med.; Brit. M. J.; Lancet; Münch. med. Wchnschr.; and Berl. klin. Wchnschr.

ASAFETIDA.

U. S. P. IX: To yield not less than 60 per cent of alcohol soluble constituents. Ash not exceeding 15 per cent. Powdered asafetida

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should be 50 per cent soluble in alcohol. Ash not exceeding 30 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 363, and Abstr. Prop. Changes, Part 2, 1914, p. 5.

Anon.: The second supplement to the Ph. Ndl. IV permits 15 per cent of ash in asafetida.—Pharm. Weekblad, 1914, v. 51, p. 83; also Pharm. Post, 1914, v. 47, p. 125.

Noyes, C. R.: A large part of the asafetida as it appears on the market does not comply with the U. S. P. Probably this does no harm, provided you insist on knowing exactly what percentage of soluble gum resin you get.—Proc. Minnesota Pharm. Assoc. 1914, p. 191; also J. Am. Pharm. Assoc. 1914, v. 3, p. 855.

Seil, H. A.: The standard proposed by several European workers, based on the sulphur content of asafetida, is inadequate because it would countenance adulteration in some instances to the extent of 50 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 143.

Gehe & Co.: The quality of the available asafetida has materially improved, though the supply of the better quality of the drug in years has been insufficient.—Handelsbericht, 1914, p. 49.

Roberts, J. G.: The improvement noted in asafetida over a year ago is still in evidence, as most of the samples examined were of excellent quality.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 130.

Caesar & Loretz: The determination of resin content of resins and gum resins.—Jahres-Ber. 1914, p. 87–88.

Sudro, W. F.: The 26 samples of gum asafetida examined varied in their character; some were very good, but the majority were grossly adulterated. The 61 samples of powdered asafetida examined showed great variation in physical characters, alcohol soluble matter, ash, and in the formation of emulsions.—Rep. North Dakota F. Com. 1914, p. 32–33.

Table showing reported variation in ash content of asafetida.

Reporters.	Number of samples.	Ash content.		References.
		Minimum.	Maximum.	
Caesar & Loretz	4	8.30	44.7	Jahres-Ber. 1914, p. 37.
E'we, G. E	7	15	54.6	Proc. Pennsylvania Pharm. Assoc. 1914, p. 130.
Hankey, W. T	19	6.2	49	Proc. Ohio Pharm. Assoc. 1914, p. 47.
Jensen, H. R	14	9.8	42	Evans' An. Notes, 1914, p. 10.
Ladd, E. F	77	2.09	75.06	Bull. North Dakota Exper. Sta. F, Dept. 1914, v. 3, p. 81–83.
Maines, E. L		8.73	16.79	J. Am. Pharm. Assoc. 1914, v. 3, p. 424.
Mann, E. W	30	1.60	62.1	Ann. Rep. Southall Bros. & Barclay, 1914, p. 7–8.
Ziefle, Adolph	26	3.13	47.68	Am. Food J. 1914, v. 9, p. 480–481.

Congdon, Leon A.: Five samples of tincture of asafetida examined; four not standard.—Rep. Kansas Bd. Health, 1914, p. 100.

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Shute, A. C.: When the quantity of milk secreted by young mothers is below normal, try asafetida, 5 drops every two hours.—Ellingwood's Therap. 1914, v. 8, p. 135.

ASPIDIUM.

U. S. P. IX: The "uncomminuted rhizome and stipes." Should be collected in the autumn and dried at a temperature not exceeding 70°. Ash not exceeding 3 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 364, and Abstr. Prop. Changes, part 2, 1914, p. 6.

Anon.: An illustrated description of male fern. *Aspidium filex-mas.*—Chem. & Drug. 1914, v. 84, p. 36.

Linke, H.: A method of assay for crude filicin should be included in the Ph. Germ.—Apoth.-Ztg. 1914, v. 29, p. 607, 628–630. See also Bohrisch, P.: Pharm. Zentralh. 1914, v. 55, p. 908; and Caesar & Loretz: Jahres-Ber. 1914, p. 23, 96–99.

Roberts, J. G.: Two of the three samples of male fern examined contained an undue proportion of old brownish fingers.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 146.

J. D. Riedel, A.-G.: Aspidium contained from 2.2 to 4.3 per cent of ash and from 9.4 to 9.7 per cent of extract soluble in ether.—Riedel's Berichte, 1914, p. 33.

Vanderkleed, C. E.: Reports four assays of male fern; from 6.85 to 10.12 per cent oleoresin; all above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

U. S. P. IX: Ether to replace acetone for making the oleoresin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 551, and Abstr. Prop. Changes, Part 3, 1914, p. 28.

Bohrisch, P.: The assay of extract of aspidium for crude filicin might be included in the Ph. Germ.—Apoth.-Ztg. 1914, v. 29, p. 901. See also Helch, Hans: Pharm. Post, 1914, v. 47, p. 572.

Caesar & Loretz: Eight samples of oleoresin of aspidium were found to contain from 24.85 to 35.58 per cent of crude filicin.—Jahres-Ber. 1914, p. 37.

Jensen, H. R.: In 7 of 10 samples of male fern extract, the filicic acid content varied from 15.6 to 25.3 per cent; the refractive index from 1.495 to 1.51.—Evans' An. Notes, 1914, p. 44.

Mann, E. W.: The filicin content of five samples of male fern extract varied from 20.4 to 27.7; specific gravity from 0.9985 to 1.030.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 17.

J. D. Riedel, A.-G.: Report on the examination of seven samples of capsules of oleoresin of aspidium. The crude filicin content was found to vary from 8.57 to 25.83 per cent. Only three of the samples contained more than 20 per cent of crude filicin.—Riedel's Berichte, 1914, p. 48.

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Puckner, W. A.: A report recommending that filicic acid be deleted from N. N. R., as it evidently belongs to that large list of medicaments which have been tried and found wanting.—Rep. Council Pharm. Chem. 1914, p. 121.

Crossley-Holland, F. W.: Oleoresin of aspidium can best be exhibited in the form of a jelly made with gelatin and glycerin, sweetened with saccharin and flavored with oil of cinnamon.—Pharm. J. 1914, v. 93, p. 133; also Year-Book of Pharmacy, 1914, p. 377–379, and Drug. Circ. 1914, v. 57, p. 616.

Schotten, Ferd.: A fatal case of poisoning by oleoresin of aspidium followed by castor oil in a case of latent Addison's disease.—Münch. med. Wchnschr. 1914, v. 61, p. 2165–2168.

Hall, Maurice C.: Report of a necropsy on a man who died from an overdose of the oleoresin of male fern administered in amounts in excess of the usual dose and followed by castor oil.—J. Am. M. Assoc. 1914, v. 63, p. 242–243.

ASPIDOSPERMA.

U. S. P. IX: The dried bark without admixture of more than 2 per cent of wood and other foreign matter. A description of the transverse sections and the microscopic appearance of the drug is added; also of the powder.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1566, and Abstr. Prop. Changes, Part 6, 1914, p. 4.

Ewins, A. J.: The alkaloids of quebracho bark. I. The constitution of aspidospermine.—Proc. Chem. Soc. 1914, v. 30, p. 258–259; also Pharm. J. 1914, v. 93, p. 662.

Cow, D.: Quebrachine is by far the most toxic of the four alkaloids of quebracho that were investigated.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 341–356. For abstract see J. Am. M. Assoc. 1914, v. 62, p. 1122.

Fourneau and Page: The differentiation between yohimbine and quebrachine.—Bull. sc. pharmacol. 1914, v. 21, p. 7–16. See also Reutter, L.: Schweiz. Apoth.-Ztg. 1914, v. 52, p. 598–599.

U. S. P. IX: The fluid extract to be made by extracting with a mixture of glycerin 110, alcohol 670, and water 220.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1569, and Abstr. Prop. Changes, Part. 6, 1914, p. 7.

ATROPINA.

Labat, A.: Practical modification of the Guglielmo reaction for the detection of atropine.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 148–149.

Kebler, L. F.: Outline of method for the determination of atropine in compressed tablets.—J. Am. Pharm. Assoc, 1914, v. 3, p. 1088.

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Marden and Elliott: In a study of distribution coefficients, it was found that the distribution ratio of atropine between water and chloroform was very small, and that three washings from 50 cc. of aqueous solution with 10 cc. portions of chloroform were quite sufficient for all practical purposes.—J. Ind. & Eng. Chem. 1914, v. 6, p. 930.

Kollo, Konstantin: Ampoules of atropine sulphate should be Tyndallized on three separate days.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Pilcher and Sollman: Quantitative studies on vagus stimulation and atropine.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 317–340.

Edsall and Means: The effect of strychnine, caffeine, atropine and camphor on the respiration and respiratory metabolism in normal human subjects.—Arch. Int. Med. 1914, v. 14, p. 897–910.

Mougeot, A.: Constant suppression of the oculo-cardiac reflex by atropine.—Compt. rend. Soc. biol. 1914, v. 76, p. 162–164. See also Petzetakis, p. 522–523; and Deleya, Paul, p. 631–632.

Sugimoto, T.: The action of atropine on the isolated uterus of the guinea pig.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 32.

Pletnew, D.: Atropine treatment of gastric disorders. Report of a number of cases, with some references to the literature.—Therap. Monatsh. 1914, v. 28, p. 30–37.

Pollard, Reginald: The atropine treatment of seasickness. The hypodermic injection of atropine sulphate has been found to be the most reliable.—Lancet, 1914, v. 186, p. 147.

Willberg, M. A.: The natural resistance of various animals to atropine.—Biochem. Ztschr. 1914, v. 66, p. 389–407.

For additional comments on atropine see Zentralbl. Biochem. u. Biophys.; Index Med.; and J. Am. M. Assoc.

AURANTII AMARI CORTEX.

U. S. P. IX: Description somewhat elaborated. Powdered bitter orange peel should be colored yellowish upon the addition of potassium hydroxide T. S. Ash not exceeding 7 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 365, and Abstr. Prop. Changes, Part 2, 1914, p. 7.

Linke, H.: Examination of bitter orange peel showed a loss of moisture at 100° of 10.2 per cent and on incineration showed the presence of 4.52 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 530.

Maines, E. L.: Dried orange peel, bitter, was found to contain from 3.28 to 4.74 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

J. D. Riedel, A.-G.: Orange rind contained from 5 to 5.6 per cent of ash, from 48 to 53.5 per cent of extract soluble in water, and from 38.1 to 45.1 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

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AURANTII DULCIS CORTEX.

U. S. P. IX: The outer rind of the fresh, ripe fruit of *Citrus aurantium sinensis* Gallesio, recently separated by grating or paring.—J. Am. Pharm. Assoc. 1914, v. 3, p. 365, and Abstr. Prop. Changes, Part 2, 1914, p. 7.

Bradford, H. C.: Formula and directions for making extracts of orange for flavoring.—Drug. Circ. 1914, v. 58, p. 73.

Rowland, E. O.: Formula for glycerin preparations of lemon and orange.—Pharm. J. 1914, v. 92, p. 544–545.

AURI ET SODII CHLORIDUM.

Stockinger, R.: One sample of gold and sodium chloride tested 29.5 per cent metallic gold, instead of 30 per cent, but answered all other U. S. P. requirements.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 139.

BALSAMUM PERUVIANUM.

Anon.: The fragrant balsam imported into the United States as balsam of Peru is produced by a tree known botanically as *Myroxylon pereirae* Klotzsch. This tree is a native of the Republic of San Salvador, on the Pacific coast of Central America.—Montreal Pharm. J. 1914, v. 25, p. 77–78. See also Spatula, 1914, v. 20, p. 176; and Schimmel & Co.: Semi-Ann. Rep. April, 1914, p. 107.

Alsberg, C. L.: A method was developed to distinguish the genuine Peru balsam from imitations and from mixtures.—Am. Food J. 1914, v. 9, p. 21. See also Seil, H. A.: J. Am. Pharm. Assoc. 1914, v. 3, p. 144.

Fernau, Albert: The pharmacopœia should include tests for perugen and similar compositions containing balsam of tolu.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 228. See also Herzog, J.: Apoth.—Ztg. 1914, v. 29, p. 310.

Enz, Karl: Factitious and true balsam of Peru; a comparison of the behavior of the products with alcohol, chloroform, petroleum ether, and nitric acid.—Südd. Apoth.-Ztg. 1914, v. 54, p. 94–95.

Caesar & Loretz: The methods of testing balsam of Peru and the requirements of the several pharmacopœias.—Jahres-Ber. 1914, p. 51.

Gehre & Co.: The differentiation between factitious and genuine balsam of Peru offers certain difficulties. A number of qualitative tests are described.—Handelsbericht, 1914, p. 50; also Südd. Apoth.-Ztg. 1914, v. 54, p. 239.

Rupp, E.: Outline of method for determining the cinnamein content of balsam of Peru; also the saponification number.—Apoth.-Ztg. 1914, v. 28, p. 723; also Süd. Apoth.-Ztg. 1914, v. 54, p. 302.

Rosenthaler, L.: The optical activity of cinnamein, with a table showing the comparative behavior of a number of samples of true

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and factitious balsam of Peru.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 273–275.

Sortell, A. W.: On the composition of the volatile oil from balsam of Peru.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 233–234. See also Dieterich, Karl, p. 376–383; and Schimmel & Co.: Semi-Ann. Rep. 1914, April, p. 80.

Mann, E. W.: Four samples of Peruvian balsam were examined; in two the proportion of cinnamein present was rather low.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 21.

Hankey, William T.: of eight samples of balsam of Peru examined, one contained rosin, turpentine, storax, and fatty oils. The cinnamein content varied from 57.48 to 63.24 per cent, and the saponification value of the cinnamein varied from 240.2 to 262.1.—Proc. Ohio Pharm. Assoc. 1914, p. 53.

Jensen, H. R. Four samples of Peru balsam of good quality gave: acid value, 56 to 67.2; saponification value, 224.9 to 243.6; iodine value, 42.5 to 54.7; specific gravity, 1.155 to 1.1665; refractive index, 1.5948 to 1.5983.—Evans' An. Notes, 1914, p. 53.

BALSAMUM TOLUTANUM.

Anon.: The second supplement to the Ph. Ndl. IV requires that balsam of tolu be partially soluble in carbon disulphide, and that, on evaporating the solution, the residue be crystalline.—Pharm. Weekblad, 1914, v. 51, p. 83.

Rupp, E.: Outline of method for determining the saponification number of balsam of tolu.—Apoth.-Ztg., 1914, v. 29, p. 723; also Südd. Apoth.-Ztg., 1914, v. 54, p. 302.

E'we, G. E.: Twelve lots of tolu balsam ranged from 96.7 to 99.9 per cent soluble in alcohol and were otherwise satisfactory.—Proc. Pennsylvania Pharm. Assoc., 1914, p. 159.

Baker, W. L.: One sample of balsam of tolu was found to be deficient in alcohol-soluble content; another sample contained rosin.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Mann, E. W.: A large number of samples have been assayed for free and combined aromatic acids. Eighteen samples were found to contain from 70.8 to 94.6 per cent material soluble in alcohol (90 per cent), and from 7.1 to 10.6 per cent free balsamic acid (calculated as benzoic acid).—Ann Rep. Southall Bros. & Barclay, 1914, p. 25.

Jensen, H. R.: Thirteen samples of balsam of tolu showed: acid value, 112 to 124.4; saponification value, 182.8 to 205.1; ester value, 68.6 to 88.9.—Evans' An. Notes, 1914, p. 67.

Reum, Arthur: A formula for making sirup of tolu, using a 40 per cent tincture and magnesim carbonate as the absorbing powder.—Pacific Pharm. 1914, v. 7, p. 262.

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U. S. P. IX: The dried leaves and tops, with not more than 10 per cent of stems. Ash not exceeding 20 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 365, and Abstr. Prop. Changes, Part 2, 1914, p. 7.

Sievers, A. F.: The possibility of increasing the alkaloidal content of belladona plants through selection.—J. Am. Pharm. Assoc. 1914, v. 3, p. 98–103, and p. 492–495; also Am. J. Pharm. 1914, v. 86, p. 97–112, and p. 483–505.

Miller, F. A.: Report of propagation experiments with belladonna.—Bull. Torrey Bot. Club, 1914, v. 41, p. 118; also Lilly Sci. Bull. 1914, Ser. 1, p. 129, and J. Am. Pharm. Assoc. 1914, v. 3, p. 310.

Miller and Reed: A study of American grown belladonna.—J. Ind. & Eng. Chem. 1914, v. 6, p. 25–26; also Lilly Sci. Bull. 1914, Ser. 1, p. 169–172.

Newcomb, Edwin L.: Belladonna and hyoscyamus. A report on cultivation experiments, with a number of illustrations.—Am. J. Pharm. 1914, v. 86, p. 531–542. See also Haynes and Newcomb: Merck's Rep. 1914, v. 23, p. 11–12.

Hooper, David: Belladonna grows in the western Himalayas, from 6,000 to 12,000 feet; from Simla to Kashmir.—Montreal Pharm. J. 1914, v. 25, p. 3.

Lloyd, John Uri: Characteristics and constituents of belladonna.—Eclectic M. J. 1914, v. 74, p. 228.

Allen and Deane: The adulteration of belladonna leaves, with illustrations showing the structural characteristics of ailanthus, phytolacca, and scopola.—Pharm. J. 1914, v. 92, p. 121–123; also Year-Book of Pharmacy, 1914, p. 337–343.

Sayre, L. E.: The leaves of *Phytolacca decandra* (poke), which have often been used to adulterate belladonna, may be distinguished by the presence of bundles of needle-shaped crystals.—Proc. Kansas Pharm. Assoc. 1914, p. 22.

Holmes, E. M.: Both ailanthus and phytolacca occur as adulterants of belladonna. Indeed no sample of dried belladonna leaves ought to be passed into stock at the present time without careful examination.—Pharm. J. 1914, v. 92, p. 214.

Lilly, J. K.: Gross adulteration of belladonna leaves to the amount of from 50 to 75 per cent with scopola is frequent.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug. Rep. 1914, v. 86, September 30, p. 34.

Neal, P. C.: Of 18 samples of belladonna leaves examined, 16 were accepted and 2 rejected.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

Lewis, S. Judd: The leaves of belladonna contained 10.95 per cent moisture, and yielded 16.17 per cent of ash, calculated on the dry drug.—Pharm. J. 1914, v. 92, p. 128; also Year-Book of Pharmacy, 1914, p. 365–366.

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J. D. Riedel, A.-G.: Belladonna leaves contained from 11 to 14.8 per cent of ash, from 30.1 to 35.2 per cent of extract soluble in water, and from 25.9 to 34 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Maines, E. L.: Belladonna leaves were found to contain 6.25 to 13.30 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Fernau, Albert: A minimum content of alkaloid for belladonna leaves should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 253.

Caesar & Loretz: The valuation of belladonna, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 81–83.

Dichgans, H.: A comparative study of the several official assay processes for belladonna folia.—Apoth.-Ztg. 1914, v. 29, p. 441, 452, 462. See also Caesar & Loretz: Jahres-Ber. 1914, p. 24–25.

U. S. P. IX: Method of assay as under belladonna root.—J. Am. Pharm. Assoc. 1914, v. 3, p. 987, and Abstr. Prop. Changes, Part 4, 1914, p. 4.

Ferencz and Dávid: Report on comparative assays of extract of belladonna by means of the new silico-tungstic acid method and the method official in the Ph. Hung. III.—Pharm. Post, 1914, v. 47, p. 562.

Rusby, H. H.: A sample of belladonna leaf that contained 0.099 per cent of alkaloid probably was a sophistication and may have consisted of henbane.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1290.

Anselmino, O.: Observations on the alkaloid content of belladonna leaves and the relation of the alkaloid content to ash content and moisture content.—Arb. Pharm. Inst. Univ. Berl. 1914, p. 36–38.

Table showing reported variation in alkaloidal content of belladonna leaves.

Reporters.	Number of samples.	Alkaloidal principles.		References.
		Minimum.	Maximum.	
Caesar & Loretz.....	6	0.203	0.449	Jahres-Ber. 1914, p. 38.
Hankey, William T....	17	.113	.487	Proc. Ohio Pharm. Assoc. 1914, p. 46.
Patch, E. L.....	5	.03	.35	J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.
Roberts, J. G.....	9	.19	.38	Proc. Pennsylvania Pharm. Assoc. 1914, p. 131.
Vanderkleed, C. E.....	16	.364	.608	Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

U. S. P. IX: To require that 1 gm. of the extract and of the powdered extract represent 4 gm. of belladonna leaves and yield not less than 1.18 nor more than 1.32 per cent of the mydriatic alkaloids of belladonna leaves.—J. Am. Pharm. Assoc. 1914, v. 3, p. 533, 987, and Abstr. Prop. Changes, Part 3, 1914, p. 10, 11, and Part 4, p. 4.

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Patterson and Lentz: Report of a study on the manufacture and assay of fluid extract of belladonna by the official process.—Proc. Maryland Pharm. Assoc. 1914, p. 103–106.

Brown, Lucius P.: Of three samples of fluid extract of belladonna examined, two were found to be illegal.—Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.

U. S. P. IX: To require that 100 cc. of the tincture yield not less than 0.03 nor more than 0.033 gm. of the mydriatic alkaloids from belladonna leaves.—J. Am. Pharm. Assoc. 1914, v. 3, p. 987, and Abstr. Prop. Changes, Part 4, 1914, p. 4.

Table showing some of the analytical results reported for tincture of belladona.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, Lucius P.	8	4	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1 p. 27.
Stadtmueller, F. H.	40	25	Rep. Connecticut D. & F. Com., 1914, p. 15.
Street, J. P.	40	23	Rep. Connecticut Agric. Exper. Sta., 1914, p. 335.
Todd, A. R.	7	5	Rep. Michigan D. & F. Com., 1914, p. 176.
Todd, A. R.	6	5	Bull. Michigan D. & F. Dept., 1914, January-February, p. 17.
Ziefle, Adolph	71	71	Rep. North Dakota Agric. Exper. Sta., 1912, 1914, p. 157–158.

U. S. P., IX: The hydrous wool fat in ointment of belladonna is increased from 20 gm. to 30 gm.; 10 gm. less of benzoinated lard being taken.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1578, and Abstr. Prop. Changes, Part 6, 1914, p. 16.

Williams, Ed. E.: A water bath can be profitably utilized in the manufacture of ointment of belladonna.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Curry, Gordon L.: Notwithstanding the superior finish of the machine-made belladonna plaster, no better example of the qualifications of a practical pharmacist can be submitted to a physician than a nicely spread plaster on chamois or plaster skin.—Proc. Kentucky Pharm. Assoc. 1914, p. 57.

Street, John Phillips: Seven samples of belladonna plaster ranged from 0.32 to 0.44 per cent of mydriatic alkaloids. Three were somewhat below the minimum U. S. P. standard.—Rep. Connecticut Agric. Exper. Sta. 1914, p. 248.

Willberg, W. A.: The natural resistance of various animals to atrophine.—Biochem. Ztschr. 1914, v. 66, p. 389–407.

Braun, Israel: Among the group of remedies consisting of belladonna, hyoscyamus, stramonium, and lobelia, the first named is the most serviceable in the treatment of bronchial asthma.—Merck's Arch. 1914, v. 16, p. 106.

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Editorial: Belladonna exalts the action of the heart, increases the strength of the beat, and promotes freedom of the capillary circulation.—Ellingwood's Therap. 1914, v. 8, p. 64.

Nathan, Sidney: A case of belladonna poisoning, in which a belladonna plaster had been placed on a raw surface caused by a mustard leaf.—Brit. M. J. 1914, v. 1, p. 965.

BELLADONNÆ RADIX.

U. S. P. IX: The dried root with not more than 10 per cent of its stem bases. Ash not exceeding 7 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 366, and Abstr. Prop. Changes, Part 2, 1914, p. 8.

Lewis, S. Judd: The root of belladonna contained 11.72 per cent moisture and yielded 6.48 per cent of ash calculated on the dry drug.—Pharm. J. 1914, v. 92, p. 128; also Chem. & Drug. 1914, v. 85, p. 169.

Caesar and Loretz: The valuation of belladonna root, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 93–94.

Roberts, J. G.: As usual, all of the samples of belladonna root examined were of standard strength and quality. Results ranging from 0.52 to 0.67 per cent of mydriatic alkaloids were obtained.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 131.

Mann, E. W.: Considerable variation in alkaloid strength of belladonna root has been experienced. Thirteen samples tested from 0.22 to 0.56 per cent of alkaloids.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 9.

Vanderkleed, C. E.: Reports 22 assays of belladonna root; found to vary from 0.410 to 0.700; 19 above and 3 below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Jensen, H. R.: Fourteen samples of foreign belladonna root yielded from 0.2 to 0.49 per cent of hyoscyamine by the Keller ether extraction method.—Evans' An. Notes, 1914, p. 13.

BENZALDEHYDUM.

Rupp, E.: Outline of method for determining halogens in benzaldehyde.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 302.

Dodge, Francis D.: The detection of chlorine in benzaldehyde and oil of bitter almond by a modification of the combustion process.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1665–1666.

Mann, E. W.: Four samples of synthetic benzaldehyde had a specific gravity of from 1.050 to 1.052 and refractive index of from 1.5450 to 1.5470.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 27.

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Purvis, J. E.: The absorption spectra of the vapors and solutions of various derivatives of benzaldehyde.—J. Chem. Soc. Lond. 1914, v. 105, p. 2482–2500.

Erlenmeyer, Emil: Some additional remarks on the production of lævo rotatory benzaldehyde.—Biochem. Ztschr. 1914, v. 66, p. 509–511.

Ishizaka, N.: On the condensation of benzaldehyde and isoamylamin.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2456–2460.

For additional references on benzaldehyde see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

BENZINUM.

Anon.: Under the title aether petrolei, the second supplement to the Ph. Ndl. IV includes benzin, with a boiling point of from 65 to 80, as a reagent.—Pharm. Weekblad, 1914, v. 51, p. 86.

Fernau, Albert: The boiling point of benzin should not exceed 60°.—Ztsch Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 228.

Dück: A sample of petroleum benzin was found to be contaminated with heavier products. Specific gravity was 0.743 while a good specimen should vary from 0.680 to 0.700.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 235.

Anon.: Accidents and disasters due to the use of benzin in Germany.—Südd. Apoth.-Ztg. 1914, v. 54, p. 101. See also Pharm. Zentralh. 1914, v. 55, p. 301; and Chem. Tr. J. 1914, v. 54, p. 258.

Jaffé, Rudolf: A review of nine fatal cases of benzin poisoning on record in the literature, with a report on two additional cases, and experiments on guinea pigs and rats.—Münch. med. Wchnschr. 1914, v. 61, p. 175–180. Also abstract: J. Am. M. Assoc. 1914, v. 62, p. 818.

Stephens, G. A.: Recommends petrol or gasoline as a scalp cleanser, especially when the dandruff is excessive.—(Dublin J. Med. Sc. 1912, v. 3, No. 504) J. Am. M. Assoc. 1914, v. 62, p. 240.

BENZOINUM.

U. S. P. IX: The drug known in commerce as Sumatra benzoin and Siam benzoin; described separately. Sumatra benzoin, ash not exceeding 2.5 per cent. Siam benzoin, ash not exceeding 2 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 366, and Abstr. Prop. Changes, Part 2, 1914, p. 8.

Gehe & Co.: The source of the benzoin obtained from western Asia, which was formerly considered to be *Styrax benzoin* Dryander, should, according to Hartwich, be *Styrax benzoides*. The drug coming from farther India is probably obtained from *Styrax tonkinensis*.—Handelsbericht, 1914, p. 51.

Rordorf, Hart: Some further contributions on the origin, chemistry, and properties of Siam benzoin.—Schweiz. Apoth.-Ztg. 1914,

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v. 52, p. 701–703, 713–717. See also Pharm. Zentralh. 1914, v. 55, p. 355–356.

Noyes, C. R.: Benzoin should be almost wholly soluble in alcohol. A large part of the drug as it appears on the market does not comply with these requirements.—J. Am. Pharm. Assoc. 1914, v. 3, p. 855; also Proc. Minnesota Pharm. Assoc. 1914, p. 191.

Caesar & Loretz: The determination of resin content of resins and gum resins.—Jahres-Ber. 1914, p. 87–88.

Cocking and Kettle: The analytical characters of benzoin.—Pharm. J. 1914, v. 92, p. 125–126; also Year-Book of Pharmacy, 1914, p. 357–360, and Perf. & Ess. Oil Rec. 1914, v. 5, p. 331.

Reinitzer, Friedrich: Examination of Siam benzoin. A method for the production of a new crystalline constituent of Siam benzoin.—Arch. Pharm. 1914, v. 252, p. 341–349.

Baker, W. L.: Three different lots of benzoin were rejected, all deficient in alcohol-soluble contents.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Scoville, W. L.: Reports that six lots or benzoin varied from 77 to 94 per cent alcohol soluble matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Glickman, L. H.: The 11 lots of benzoin examined ranged from 59 to 81.6 per cent of alcohol-soluble matter.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 131.

Mann, E. W.: The Ph. Brit. 15 per cent limit for matter insoluble in alcohol appears to be commercially impossible.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 9.

Jensen, H. R.: A sample of Sumatra benzoin was 14.4 per cent insoluble in 90 per cent alcohol; acid value, 119, saponification value, 211.2.—Evans' An. Notes, 1914, p. 13.

Lefeldt, M.: The Ph. Germ. V should include a requirement for alcohol soluble constituents in tincture of benzoin.—Pharm. Ztg. 1914, v. 59, p. 43.

Reum, Arthur: In making compound tincture of benzoin, it has been found advisable to place all of the ingredients directly into a wide-mouthed bottle, using 75 per cent of the alcohol necessary, and macerating for three days or longer, with occasional shaking.—Pacific Pharm. 1914, v. 7, p. 310.

Editorial: Mathematically tincture of benzoin should contain from 76.33 to 81.74 per cent of alcohol.—Pacific Pharm. 1915, v. 8, p. 252.

Brown, Charles H.: Benzoin, glycerin, and rose water lotion as a remedy for chapped hands.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 354.

Anon.: Directions for making a satisfactory lotion of rose water, glycerin, and tincture of benzoin.—Drug. Circ. 1914, v. 57, p. 725.

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See also Hensel, Samuel T.: Rocky Mountain Druggist, 1914, v. 28, December, p. 14–15.

BENZOL.

Anon.: There are now upward of 70 German makers of benzol who produce an article of uniform quality.—J. Ind. & Eng. Chem. 1914, v. 6, p. 259.

Richards and Shipley: The freezing point of benzene as a fixed point in thermometry.—J. Am. Chem. Soc. 1914, v. 36, p. 1825–1832; also Chem. News, 1914, v. 110, p. 187–189.

Schenk, Konrad: The determination of sulphur in commercial benzol.—Chem.-Ztg. 1914, v. 38, p. 83–84.

Jensen, H. R.: One sample of benzol, with specific gravity 0.880, 90 per cent of which distilled up to 100°, gave a decided thiophene reaction.—Evans' An. Notes, 1914, p. 13.

Flürscheim, Bernard: Constitution of the benzene nucleus with reference to the phenomenon of di-substitution.—Chem. News, 1914, v. 110, p. 1–2.

Schiff, F.: The influence of benzol on the active anaphylaxis of guinea pigs.—Ztschr. Immun. u. exper. Therap. 1914, v. 23, p. 61–65.

Benians, T. H. C.: The resistance of various bacteria to the disinfecting action of toluol, and the allied bodies, benzol and xylol.—Ztschr. Chemotherap. 1914, v. 2, p. 28–49.

Sappington and Pearson: A report of three cases, with a metabolism study of acute leukemia.—J. Am. M. Assoc. 1914, v. 63, p. 143–146.

Boruttau and Stadelmann: A contribution on the chemical basis for the benzol treatment of leukemia.—Biochem. Ztschr. 1914, v. 61, p. 372–386. See also Editorial: Therap. Gaz. 1914, v. 38, p. 398.

Møller, H. C. V.: Benzol in leukemia. Thirty-five cases of lukemia in women between 39 and 62 are reported.—(Hospitalstidende, Copenhagen, v. 42, July 1, No. 26) J. Am. M. Assoc. 1914, v. 63, p. 440.

A book review calls attention to a volume by Laurence Selling on the action of benzol (benzene, C_6H_6) on the blood-making organs.—J. Am. M. Assoc. 1914, v. 62, p. 1984.

For additional comments on benzol see Index. Med.; J. Am. M. Assoc.; Zentralbl. Biochem. Biophys.; Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

BENZOSULPHINIDUM.

Fernau, Albert: The conversion of benzosulphinide into salicylic acid by means of potassium hydroxide does not succeed at higher temperatures.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 263.

E'we, G. E.: All of the lots of saccharin examined had melting points higher than the U. S. P. requirement of 219° to 220°. One lot

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melted at 225°, but was otherwise U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 155.

Jensen, H. R.: Three samples of saccharin from different sources varied in strength from 69.2 to 99.8 per cent; from 165° to 222°.—Evans' An. Notes, 1914, p. 57.

Marden, J. W.: The determination of saccharin. A study of the methods of extraction by means of immiscible solvents from the point of view of the distribution coefficient.—J. Ind. & Eng. Chem. 1914, v. 6, p. 318–320.

Pazienti, U.: On the determination of saccharin and of the sodium salt of saccharin.—Ann. Chim. applicata, 1914, v. 2, p. 290–294.

Condelli, Sebastiano: On the detection and determination of saccharin in mixtures.—Boll. chim.-farm. 1914, v. 53, p. 97–102.

Jackson, Cook, and Strickland: In Rhode Island, the use of saccharin or its allied products, the use of dulcin, or its allied products, or the use of any other artificial sweetener in all food or food materials is prohibited.—Rep. Rhode Island F. & D. Com. 1914, p. 5.

Caspari, Chas. E.: Some truths about saccharin and an argument for its more widespread use.—Am. Food J. 1914, v. 9, p. 517–519.

Wagner, T. B.: The use of saccharin in foods as a substitute for sugar.—J. Ind. & Eng. Chem. 1914, v. 6, p. 73. See also Editorial: Pract. Drug. 1914, v. 32, p. 534.

Dafert, F. W.: The use of saccharin in the imitation or adulteration of foods.—Arch. Chem. u. Micros. 1914, v. 7, p. 44–47.

Editorial: A review of some of the conflicting opinions regarding the use of saccharin in foods.—Pharm. Era, 1914, v. 47, p. 357.

Roy, Reuben F.: Text, with decision, of Supreme Court of Missouri on the use of saccharin in nonalcoholic drinks.—Am. Food J. 1914, v. 9, p. 305.

Queeny, John F.: Presents a resolution requesting that the Bureau of Chemistry ruling affecting saccharin be changed so as to be in accordance with the findings of the referee board.—Proc. N. A. M. M. P. 1914, p. 89–90.

Anon.: Saccharin has a legitimate place as a sweetening agent for certain pharmaceutical preparations.—Am. Druggist, 1914, v. 62, p. 96; also Phys. Drug. News, 1914, v. 8, p. 137.

BERBERIS.

Anon.: An illustrated description of berberis, the structural characteristics of *Berberis aquifolium*, and the use to which the drug has been put.—Southern Pharm. J. 1914, v. 6, p. 309–311.

Rippetoe, J. R.: One sample of berberis was found to contain 8.15 per cent of alcohol (49 per cent) extract, and 2.15 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 436.

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Maines, E. L.: Berberis was found to contain 2.07 to 3.20 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Richter, Erw.: Berberine and its determination. The constitution and properties of berberine, and its determination in preparations.—Arch. Pharm. 1914, v. 252, p. 192–205.

Thorburn, A. D.: Two samples of fluid extract of berberis were found to be 60 and 67 per cent below standard.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 212.

BETANAPHTHOL.

Katayama and Ikeda: On a new color reaction of beta-naphthol. A chloroform solution of beta-naphthol gives with concentrated potassium hydroxide a blue color.—J. Pharm. Soc. Japan, 1914, October, p. 1142.

Bianchini, Gino: On the incompatibility existing between salol, sulphonal and beta naphthol.—Atti accad. Lincei, 1914, v. 23, p. 608–615.

BISMUTHI SUBCARBONAS.

Treubert and Vanino: A contribution to the controversy over the existence of bismuthyl.—Ztschr. Anal. Chem. 1914, v. 53, p. 564–568.

Mann, E. W.: The Ph. Brit. V has fixed the fairly stringent maximum for arsenic in bismuth salts of 2 parts per million. With very few exceptions the official salts examined during the two years complied with this standard.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 43.

Brandt, L.: Observations on the quantitative separation of arsenic and bismuth.—Chem.-Ztg. 1914, v. 38, p. 474.

Hill, C. A.: Of 247 samples of bismuth carbonate examined during the years 1910 to 1913, inclusive, the nitrate, calculated as bismuth subnitrate, was found to vary from 0 to 6 per cent. The arsenic content varied from 0 to 2.4 parts per million.—Chem. & Drug. 1914, v. 85, p. 18, 21.

Issraeliantz, L.: Observations on the action of astringents on the gastric secretion especially on pepsin adsorption.—Therap. Monatsh. 1914, v. 28, p. 117–123.

BISMUTHI SUBGALLAS.

E'we, G. E.: Two lots of bismuth subgallate examined contained slightly more water than the U. S. P. allowance of 7 per cent, testing 7.12 and 7.52 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 131.

Department of Agriculture: Reports that dermatol contained 20 per cent of sulphur.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287; also Am. Druggist, 1914, v. 62, p. 17.

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Newman, E. A. R.: Bismuth subgallate gauze in the treatment of wounds.—Brit. M. J. 1914, v. 2, p. 837.

BISMUTHI SUBNITRAS.

Enz, Karl: The official Ph. Germ. V. test for lead is sufficiently delicate. In the pharmacopœial test for arsenic with tin chloride, daylight must be guarded against; otherwise the results may be misleading.—Südd. Apoth.-Ztg. 1914, v. 54, p. 470–471.

Guérin, G.: On the detection of lead in bismuth subnitrate.—J. pharm. et chim. 1914, v. 10, p. 22–23.

E'we, G. E.: One lot of bismuth subnitrate examined was discolored, probably by hydrogen sulphide in the air, since it was supplied in a paper bag.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 131.

Hill, C. A.: Of 93 samples of bismuth subnitrate examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0 to 1.6 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

Kebler, L. F.: Outline of method for the determination of bismuth subnitrate in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1088.

Congdon, Leon A.: Three samples of bismuth tablets; one not standard.—Rep. Kansas Bd. Health, 1914, p. 100.

Zadek, J.: On the causes of nitrite poisoning by bismuth subnitrate.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 498–516.

Beck, Emil G.: The prevention of bismuth poisoning in hip-joint disease.—J. Am. M. Assoc. 1914, v. 62, p. 231.

Sandwith, F. M.: The value of bismuth subnitrate or salicylate in the treatment of dysentery.—Lancet, 1914, v. 187, p. 735.

BISMUTHI SUBSALICYLAS.

Hill, C. A.: Of 49 samples of bismuth salicylate examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0 to 8 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

BROMUM.

Kubierschky, K.: Apparatus for the production of bromine; illustrated.—(Chem. Apparatur, 1914, v. 1, p. 2–5) J. Soc. Chem. Ind. 1914, v. 33, p. 135.

Linke, H.: The Ph. Germ. V specific gravity for bromine, about 3.1, is evidently calculated at 0°. At the usual temperature of 15°, the specific gravity ranged from 2.97 to 2.99.—Apoth.-Ztg. 1914, v. 29, p. 489.

Cole, Harriet I.: The estimation of iodine and bromine in haloid salts by means of telluric acid.—Am. J. Sci. 1914, v. 188, p. 537.

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Carnot and Coirre: Localization of bromine after its therapeutic administration.—Compt. rend. Soc. biol. 1914, v. 76, p. 641; also Labat, A.: Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 355–362.

BUCHU.

U. S. P. IX: The dried leaves of *Borosma betulina*, known in commerce as short buchu, or of *Barosma serratifolia*, known in commerce as long buchu, described elaborately. Ash not exceeding 4 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 367, and Abstr. Prop. Changes, Part 2, 1914, p. 9.

Anon.: Round buchu (*Barosma betulina*) is alone recognized in the Ph. Brit. and the revision authority has decided to again exclude the long variety.—Brit. & Col. Drug. 1914, v. 65, p. 513. See also Editorial: Drug. Circ. 1914, v. 57, p. 604.

Anon.: Illustrated description of buchu; the structural appearance of short and of long buchu leaves and of the flowering branches of the shrubs yielding them; also description of the structural characteristics of the drugs.—Southern Pharm. J. 1914, v. 6, p. 344–345.

Editorial: The exports of buchu from South America in 1908 were 243,742 pounds, in 1912, 223,000 pounds, in 1913, 163,000 pounds, and in 1914 it is believed will show a record reduction, viz, to 75,000 pounds.—Brit. & Col. Drug. 1914, v. 65, p. 491–492. See also Editorial: Oil, Paint & Drug Rep. 1914, v. 85, June 1, p. 9.

Schimmel & Co.: The buchu plant appears to be rather difficult of cultivation; the cuttings do not take root readily; they thrive best in very sandy soil.—Semi-Ann. Rep. April, 1914, p. 33.

Lilly, J. K.: Slight admixture of species of buchu not answering to the description of the U. S. P. has been noted.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Editorial: Note on a new kind of buchu. The leaves correspond very closely with the leaves of *Barosma scoparia* E. and Z.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 373–374.

Anon.: The character of the volatile oil from the leaves of *Barosma venusta*.—Perf. & Ess. Oil. Rec. 1914, v. 5, p. 428.

Rippetoe, J. R.: Ten samples of short buchu contained from 3.70 to 5.06 per cent of ash and from 3.46 to 21.79 per cent of stem. Three samples of long buchu were found to contain from 19.56 to 24.90 per cent of alcohol (73 per cent) extract, from 4.20 to 5.22 per cent of ash, and from 8.90 to 15.18 per cent of stems.—Am. J. Pharm. 1914, v. 86, p. 436–437.

Maines, E. L.: Long buchu was found to contain from 3.84 to 4.60 per cent of ash. Short buchu was found to contain from 4.75 to 5.24 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

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Baker, W. L.: A large percentage of stems were found to be present in a sample of short buchu.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Rusby, H. H.: Ten bales of buchu were found to consist largely of chopped stems and branches. The importer was allowed to remove the stems, but he had only 4½ bales of material left.—Proc. New York Pharm. Assoc. 1914, p. 117.

CAFFEINA.

Fendler and Stüber: The determination of caffeine in coffee. A comparison of the several methods that have been proposed.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 9–20; also Südd. Apoth.-Ztg. 1914, v. 54, p. 535–536.

Marden, J. W.: The determination of caffeine. A study of the methods for extraction by means of immiscible solvents from the point of view of the distribution of coefficients.—J. Ind. & Eng. Chem. 1914, v. 6, p. 320.

Wagenaar, M.: Microchemical reactions for caffeine, theobromine, theophylline, and their derivatives by sublimation.—Pharm. Weekblad, 1914, v. 51, p. 23–24.

E'we and Vanderkleed: Volatility of caffeine and of acetanilide in a current of steam; 0.8 per cent of the caffeine was recovered from the distillate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1683.

Kebler, L. F.: Outline of method for the determination of caffeine in compound tablets containing acetanilide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1080.

Knud, J. A. Secher: Report of observations on the action of caffeine on striated muscle fiber.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 83–121.

Lucas, William Palmer: Studies in cardiac stimulants, including drugs of the strychnine and caffeine group.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 54–83.

Newburgh, L. H.: Therapy of cardiovascular disturbances. Caffeine did not stimulate the cardiovascular apparatus in any of the conditions studied.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 84–91. See also J. Am. M. Assoc. 1914, v. 63, p. 311–313; and Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 75.

Taylor, Lester: Clinical studies in caffeine. A preliminary report with observations on the effect on the pulse rate, effect on the respiratory rate, the blood pressure, diuresis, and the body weight.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 118–130; also Arch. Int. Med. 1914, v. 14, p. 769–778, and J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 516.

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Edsall and Means: The effect of strychnine, caffeine, atropine, and camphor on the respiration and respiratory metabolism in normal human subjects.—Arch. Int. Med. 1914, v. 14, p. 897–910.

Salant and Kahn: Further observations on caffeine glycosuria. An abstract.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 512. See also Salant and Rieger: Am. J. Physiol. 1914, v. 33, p. 186–203.

Poffenberger, A. T.: A comparison of the effects of caffeine and strychnine on mental and motor efficiency.—Therap. Gaz. 1914, v. 38, p. 241–245.

Macht, D. I.: The action of drugs on the isolated pulmonary artery. Caffeine was found to produce a dilatation of the pulmonary ring. Curiously enough, theobromine, a closely allied purine body, produced no such effect, and indeed showed a tendency to a constrictor action.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 24.

Janeway, Theodore C.: The comparative value of cardiac remedies, including the study of the action of strophanthin, digitalis, caffeine, and its allies.—Arch. Int. Med. 1914, v. 13, p. 361–383.

Frankland, W. Ashby: The effects of caffeine and nicotine on the activity of the intestinal musculature.—New York M. J. 1914, v. 100, p. 307–308.

Githens, T. S.: The influence of decerebration on the convulsant action of caffeine in frogs.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 166–167.

Vinci, Gaetano: The histological modifications of the kidney determined by caffeine.—Arch. farmacol. sper. 1914, v. 17, p. 503–528, 544–580.

For additional references to caffeine see Index Med.; J. Am. M. Assoc.; Zentralbl. Biochem. u. Biophys.; Zentralbl. exper. Med.

CAFFEINA CITRATA.

Kebler, L. F.: Outline of method for the determination of citrated caffeine in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1089.

Department of Agriculture: Reports that 2-gr. caffeine citrated tablets were less than 1 gr.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

U. S. P. IX: Effervescent citrate of caffeine should contain not less than 1.9 per cent of anhydrous caffeine. Method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 549, and Abstr. Prop. Changes, Part 3, 1914, p. 26.

Editorial: Citrated caffeine has been found to be of use as a hemostatic, especially when used at the menopause, where there are frequent floodings. It has also been used in menorrhagia and metrorhagia and in post-partum hemorrhage.—Ellingwood's Therap. 1914, v. 8, p. 117.

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CAFFEINÆ SODIO-SALICYLAS, N. F.

Rupp, E.: Outline of method for determining the caffeine content of caffeine sodium salicylate.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 314.

Kollo, Konstantin: Ampoules of caffeine sodium benzoate and of caffeine sodium salicylate may be sterilized for one hour at 100°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Newburgh, L. H.: Therapy of cardiovascular disturbances. With the methods used caffeine sodio-salicylate had no beneficial effect on the cardiovascular disturbances of the infectious diseases.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 84–91.

CALAMINE.

Noyes, C. R.: According to authorities calamine is an impure zinc carbonate, depending, perhaps, for its medicinal effects upon its impurities.—J. Am. Pharm. Assoc. 1914, v. 3, p. 856; also Proc. Minnesota Pharm. Assoc. 1914, p. 193.

CALAMUS.

Anon.: Illustrated description of calamus rhizome; the structural characteristics of the drug.—Southern Pharm. J. 1914, v. 6, p. 355–356.

J. B. Riedel, A.-G.: Calamus contained from 2.9 to 5.7 per cent of ash and from 17 to 18.1 per cent of extract soluble in two parts of alcohol and three parts water.—Riedel's Berichte, 1914, p. 33.

Freund, Hans: The composition of tincture of calamus and methods for testing the preparation.—Pharm. Zentralh. 1914, v. 55, p. 264–265.

Thoms and Beckstroem: Observations on the constituents of oil of calamus.—Arb. pharm. Inst. Univ. Berl. 1914, v. 67–68. See also Schimmel & Co.; Semi-Ann. Rep. April, 1914, p. 33–35.

Asahina and Imai: On the sesquiterpene contained in Japanese calamus oil.—J. Pharm. Soc. Japan, 1914, p. 1257.

CALCII CARBONAS PRÆCIPITATUS.

Baker, W. L.: Two lots of calcium carbonate contained aluminum in excess of the U. S. P. limits.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

E'we, G. E.: One lot of precipitated calcium carbonate examined contained an excessive amount of iron.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 132.

Hill, C. A.: Of 50 samples of precipitated calcium carbonate examined during the years 1912 and 1913, the lead content varied from

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2 to 35 parts per million. The arsenic content varied from 0.2 to 2 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

Jensen, H. R.: Of 12 samples of precipitated chalk, only 1 exceeded 20 parts of lead per million; this sample contained 25 parts.—Evans' An. Notes, 1914, p. 16.

CALCII CHLORIDUM.

E'we, G. E.: One lot of calcium chloride examined contained many particles having yellowish spots. These were found to be due to iron.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 132.

Simeon, Frederick: Experimental observations on the viscosity of calcium chloride solutions.—Phil. Mag. 1914, v. 27, p. 95–100. See also Walker, W. J., p. 288–297.

Kayser, Curt: Clinical and experimental studies on calcium therapy, especially in bronchial asthma. Consideration of the use of calcium chloride.—Ztschr. exper. Path. u. Therap. 1914, p. 369–378.

Kahn, Max: Calcium therapy of tuberculosis.—Med. Rec. 1914, v. 85, p. 924–927.

Göppert, F.: Prolonged mild calcium medication seems to reduce the tendency to hay fever.—(Med. Klin. v. 10, June 14, No. 24) J. Am. M. Assoc. 1914, v. 63, p. 283.

Emmerich and Loew: A report of five cases, in which a chronic tendency to hay fever was broken up and the patients permanently freed from its grip by continued treatment with calcium chloride.—(Monat. Geburt. Gynäkol. 1913, v. 38, No. 6) J. Am. M. Assoc. 1914, v. 62, p. 247.

CALCIUM GLYCEROPHOSPHATE.

U. S. P. IX: To contain not less than 90 per cent of anhydrous normal calcium glycerophosphate. One gm. dissolves in about 50 cc. of water at 25°. Test for phosphates, chloride, sulphate, and limit of alcohol soluble impurities are added. Also a method of assay.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1566, and Abstr. Prop. Changes, Part 6, 1914, p. 4.

Anon.: The second supplement to the Ph. Ndl. IV describes calcium glycerophosphate as the neutral salt, soluble in 24.7 parts of water.—Pharm. Post, 1914, v. 47, p. 125; also Pharm. Weekblad, 1914, v. 51, p. 77.

Umney and Bennett: Commercial calcium glycerophosphate is of variable composition and does not correspond with a definite proportion of water.—Pharm. J. 1914, v. 93, p. 134–135; also Year-Book of Pharmacy, 1914, p. 406.

King and Pyman: The constitution of the glycerylphosphates. The synthesis of alpha and beta-glycerylphosphates.—J. Chem. Soc. Lond. 1914, v. 105, p. 1238–1259.

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DuBois, Gaston: Commercial calcium glycerophosphate is a mixture of the alpha and beta isomerides.—J. Ind. & Eng. Chem. 1914, v. 6, p. 125–126.

François and Boismenu: A method for the assay of calcium glycerophosphate.—J. pharm. et chim. 1914, v. 10, p. 10–13; also Ann. Falsif. 1914, v. 7, p. 426.

DuBois, G.: Calcium glycerophosphate frequently contains citric acid to make it soluble in water. A true salt can be made, which is soluble in about 22 parts of water, without the aid of acid, and this soluble form remains in solution much better than the acid substitute.—Bull. Pharm. 1914, v. 28, p. 306.

Baker, W. L.: A sample of calcium glycerophosphate was found to contain an appreciable amount of chlorides; another sample contained citric acid.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

E'we, G. E.: One lot of calcium glycerophosphate was examined which contained an excess of calcium with resulting alkaline reaction.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 132.

Anon.: Formula for a compound solution of glycerophosphates of calcium, sodium, iron, manganese, quinine, and strychnine, with glycerin as a preservative.—N. A. R. D. Notes, 1914, v. 18, p. 364.

CALCII HYPOPHOSPHIS.

Rupp, E.: The quantitative determination of calcium hypophosphite makes a number of the Ph. Germ. V qualitative tests superfluous.—Südd. Apoth.-Ztg. 1914, v. 54, p. 302. See also Apoth.-Ztg. 1914, v. 29, p. 723.

E'we, G. E.: One lot of calcium hypophosphite examined was strictly U. S. P. except for a trace of iron. It assayed 98.3 per cent absolute calcium hypophosphite.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 132.

Baker, W. L.: A solution of calcium hypophosphite in water was decidedly opaque.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Hill, C. A.: Of 20 samples of calcium hpyophosphite examined during the years 1912 and 1913, the lead content varied from 1 to 8 parts per million. The arsenic content varied from 0 to 4 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

Anon.: It is now agreed that the hypophosphites pass through the system unchanged; they certainly have no specific influence when used in the treatment of tuberculosis.—J. Am. M. Assoc. 1914, v. 62, p. 2043.

CALCIUM LACTATE.

Hill, C. A.: Of 114 samples of calcium lactate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 15

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parts per million. The arsenic content varied from 0 to 20 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

Anon.: It is generally agreed that calcium lactate is less irritating than the chloride and would perhaps be the best salt to give intramuscularly and by hypodermic injection.—J. Am. M. Assoc. 1914, v. 62, p. 634.

White, Charles J.: The curative powers of calcium lactate in the treatment of certain dermatoses appear to be limited.—J. Am. M. Assoc. 1914, v. 62, p. 1921.

Kayser, Curt: Clinical and experimental studies on calcium therapy, especially in bronchial asthma, including experiments with calcium lactate.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 369–378.

CALCII PHOSPHAS PRÆCIPITATUS.

van Kampen, G. B.: The requirements for calcium phosphate as a medicine.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 666–684.

Hill, C. A.: Of 39 samples of calcium phosphate examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0.2 to 600 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

Mann, E. W.: Several specimens of precipitated calcium phosphate were of very indifferent quality. The proportion of 10 parts per million of arsenic found in one sample was excessive. Another contained 8 parts per million, together with considerable amounts of lead and iron.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 44.

Jensen, H. R.: Fifteen samples all had less than 5 parts arsenic per million. The best commercial grade contained from 0.004 to 0.01 per cent of lead when tested under the most sensitive conditions.—Evans' An. Notes, 1914, p. 16.

CALUMBA.

U. S. P. IX: Described somewhat elaborately. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 367, and Abstr. Prop. Changes, Part 2, 1914, p. 9.

Anon.: An illustrated description of calumba, its general appearance and structural characteristics.—Southern Pharm. J. 1914, v. 6, p. 357, 402.

Tunmann, O.: A microchemical study of the constituents of calumba, with illustrations.—Pharm. Zentralh. 1914, v. 55, p. 775–780.

Rippetoe, J. R.: One sample of calumba root was found to contain 13.05 per cent of alcohol (65 per cent) extract and 5.88 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 437.

Maines, E. L.: Calumba root was found to contain from 7.87 to 10.87 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

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J. D. Riedel, A.-G.: Calumba contained from 4.8 to 8.2 per cent of ash and from 17.5 to 18.1 per cent of extract soluble in 2 parts of alcohol and 3 parts of water.—Riedel's Berichte, 1914, p. 32.

Ramsay, C. F.: It is very difficult to thoroughly extract calumba, even after mixing with shavings. This drug contains about 35 per cent starch and 5 per cent of gum, which accounts for the trouble.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1646.

Carlson, van de Erve, Lewis and Orr: The action of the so-called stomachics or bitters on the hunger mechanism. In therapeutic quantities, the bitters, including calumba, have no effect on the gastric tonus and the gastric hunger contractions or on the parallel sensation of hunger.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 209–218.

CALX.

Burchard and Emley: The source, manufacture, and use of lime.—A separate, pages 1509–1593, from Mineral Resources of the United States for the calendar year 1913, Part 2, Washington, 1914.

Noyes, C. R.: If you buy lime for making limewater you will get an article containing perhaps 50 per cent magnesia, and also probably quantities of iron and other impurities.—J. Am. Pharm. Assoc. 1914, v. 3, p. 853; also Proc. Minnesota Pharm. Assoc. 1914, p. 189.

Stockinger, O.: All of the six lots of lime tested contained more than 90 per cent required by the U. S. P.; ranging from 94.7 to 98.4 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 144.

Bartow and Scholl: The comparative value of a calcium lime and a magnesium-calcium lime for water softening.—J. Ind. & Eng. Chem. 1914, v. 6, p. 189–191.

Slee, Arthur M.: Milk of lime may be prepared by adding 1 part of freshly water-slaked lime to 4 or 5 parts of water.—Am. J. Clin. Med. 1914, v. 21, p. 52.

U. S. P. IX: Lime water should be frequently prepared from fresh magma, the latter to be washed with boiling distilled water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 528, and Abstr. Prop. Changes, Part 3, 1914, p. 5.

Brewer, J. S.: Lime water is usually poorly prepared and poorly preserved. No matter how carefully the preparation is made, if it is kept in an ordinary container it will soon deteriorate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 605.

Bachman, Gustav: An illustrated description of an apparatus for the manufacture of lime water. (After Nitardy.)—Proc. Minnesota Pharm. Assoc. 1914, p. 130–133.

Pierce, W. E.: Five of fifteen samples of lime water were more or less deficient in their content of calcium hydroxide. This deficiency

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is thought to be due to one of two causes—carelessness in manufacture or carelessness in preservation.—Proc. Virginia Pharm. Assoc. 1913, 1914, p. 126–128.

CALX CHLORINATA.

Anon.: One of the most important chemicals in the arts is chloride of lime, or, rather, chlorinated lime, the world production of which in 1912 amounted to approximately 400,000 metric tons.—Am. Druggist, 1914, v. 62, p. 133.

Frary, Guy G.: One sample of chlorinated lime, which had been kept by a merchant for more than a year, was found to contain less than 1 per cent of available chlorine.—Rep. South Dakota F. & D. Com. 1914, p. 306–307.

Howard, Charles D.: Chlorinated lime, put out in cans commonly designated as pounds, is generally below standard, even when fresh. Four samples showed from 28.2 to 32.3 per cent chlorine.—Bull. New Hampshire Bd. Health, 1914, v. 3, p. 56.

Vosmaer, A.: The purification of water. Observations on the use of chlorinated lime.—Chem. Weekblad, 1914, v. 11, p. 927–930.

Thresh, John C.: The sterilization of potable waters by means of calcium hypochlorite.—Lancet, 1914, v. 187, p. 809–810.

Tully, E. J.: A study of calcium hypochlorite as a disinfectant of water.—Am. J. Public Health, 1914, v. 4, p. 423–435.

Whittaker, H. A.: The use of hypochlorite capsules for the treatment of small quantities of drinking water.—Am. J. Public Health, 1914, v. 4, p. 688–689.

Thomas, Stanley Judson: The hypochlorite of lime treatment of a municipal water supply and a study of certain resistant bacteria.—J. Ind. & Eng. Chem. 1914, v. 6, p. 548–552. See also Thomas and Sandman, p. 637–639.

Young, G. B.: The result of the experimental employment of hypochlorite treatment to a portion of the Chicago city water supply.—Am. J. Public Health, 1914, v. 4, p. 310–315.

Anon.: The reaction between chlorinated lime and sodium thiosulphate in the treatment of water.—Südd. Apoth.-Ztg. 1914, v. 54, p. 556.

Reisch, K.: A review of the recent literature relating to the manufacture of chlorinated lime.—Chem.-Ztg. 1914, v. 38, p. 464.

Steffenhagen, Karl: A review of the available literature on the treatment of water by means of chlorinated lime.—Hyg. Rundschau, 1914, v. 24, p. 185–208.

A book review of a volume on Chloride of Lime in Sanitation, by A. H. Hooker.—Nature, 1914, v. 92, p. 93.

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CAMBOGIA.

U. S. P. IX: When rubbed with water it should yield a yellow emulsion becoming darker and almost transparent upon the addition of ammonia water. Ash not exceeding 2 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 368, and Abstr. Prop. Changes, Part 2, 1914, p. 10.

Anon.: Gamboge has been omitted from the Ph. Brit. V. It is admittedly too drastic and uncertain.—Lancet, 1914, v. 187, p. 907.

Anon.: A description of commercial gamboge, with illustrations of the flowering branch of *Gamboge hanburii*.—Southern Pharm. J. 1914, v. 6, 402–403.

Maines, E. L.: Gamboge was found to contain from 0.82 to 1.21 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Rippetoe, J. R.: One sample of gamboge was found to contain 76.36 per cent of alcohol, and 0.85 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

Stockinger, R.: Two of the thirteen samples examined were slightly above the U. S. P. limit of 25 per cent alcohol insoluble matter.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 139.

CAMPHOR.

Grosh, D. M.: The romance of camphor. A review of some of the history of camphor.—Midl. Drug. 1914, v. 48, p. 413–414.

Huggins, Harold C.: Camphor industry in Japan, with illustrations showing a flowering branch of *Cinnamomum camphora*, and the crude form of still, used in the production of camphor.—Southern Pharm. J. 1914, v. 6, p. 295–296.

Schimmel & Co.: Tables showing the production of camphor and camphor oil in Japan, the camphor exports from Japan, and the revenue from the camphor monopoly.—Semi-Ann. Rep. April, 1914, p. 37–38. See also Editorial: Chem. & Drug. 1914, v. 84, p. 87, and Oil, Paint & Drug Rep. 1914, v. 86, December 21, p. 9.

Anon.: The possibilities of the production of camphor in the Philippines is to be tried on a large scale by the local Bureau of Forestry.—Chem. & Drug. 1914, v. 84, p. 294.

Anon.: The camphor production in India. The tree has been successfully planted in Burma, Ceylon, and the Federated Malay States.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1715.

Gehe & Co.: Economic conditions of the camphor market, with tables showing the consumption of camphor in various countries.—Handelsbericht, 1914, p. 54–58.

Fernau, Albert: The pharmacopœia should include the vanillin hydrochloric acid test for camphor. Synthetic camphor does not give a color reaction.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v.

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52, p. 228. See also Bohrisch, P.: Apoth.-Ztg. 1914, v. 29, p. 901, and Pharm Zentralh. 1914, v. 55, p. 893, 1003–1004.

Helch, Hans: A melting range should be given for camphor which melts at about 175°.—Pharm. Post, 1914, v. 47, p. 571.

Linke, H.: Six samples of camphor showed a melting point varying from 175 to 177.5°, and optical rotation of a 20 per cent solution in absolute alcohol of from +8.8 to +44°.—Apoth.-Ztg. 1914, v. 29, p. 528.

E'we, G. E.: One lot of camphor had a melting point of 178°, instead of 175° required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 133.

Rimini, E.: New researches in the camphor group.—Rend. soc. chim. ital. 1914, v. 6, p. 27–28.

Noyes and Nickell: Molecular rearrangements in the camphor series.—J. Am. Chem. Soc. 1914, v. 36, p. 118–127.

Wallerant, Fred: On the polymorphism of camphor.—Compt. rend. Acad. sc. 1914, v. 158, p. 597–598.

Marcelin, André: Study of the phenomena that accompany the movements of camphor on the surface of water.—Ann. Phys. Paris, 1914, v. 1, p. 32.

Lascoff, J. Leon: Camphor and its preparations. A review of the origin of the drug, and a list of the official U. S. P. and N. F. preparations; also formulas for a number of nonofficial preparations.—Proc. New York Pharm. Assoc. 1914, p. 267–273; also Drug. Circ. 1914, v. 57, p. 613–614, and D.-A. Apoth.-Ztg. 1914, v. 35, p. 113–114, 128–129.

Llewellyn, H. D.: Camphor water should be made as we now prepare limewater. A piece of camphor should be weighted so as to sink to the bottom of the bottle.—Proc. Missouri Pharm. Assoc. 1914, p. 141.

Penniman and Randall: A rapid method for the determination of camphor and of certain essential oils when in solution in alcohol.—J. Ind. & Eng. Chem. 1914, v. 6, p. 926–928.

Dowzard, Edwin: The determination of camphor in tablets and pills.—J. Ind. & Eng. Chem. 1914, v. 6, p. 489–490.

Marden and Elliott: A study of spirit of camphor to show the effect of added water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 91–94.

Reum, Arthur: Spirit of camphor can be readily made by plugging in the neck of a glass funnel and placing the camphor, previously pounded fine, in the funnel.—Pacific Pharm. 1914, v. 7, p. 310.

Frey, Otto: The testing of spirit of camphor and of camphorated oil according to the Ph. Austr. VIII.—Pharm. Post, 1914, v. 47, p. 85–86.

Caspari, Charles, jr.: Spirit of camphor was found which instead of containing 10 gms. of camphor in 100 cc. contained only 5 or 6 gm.—Proc. Maryland Pharm. Assoc. 1914, p. 72.

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Table showing some of the analytical results reported for spirit of camphor.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E	26	11	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, L. A	29	20	Proc. Kentucky Pharm. Assoc. 1914, p. 118.
Brown, L. P	9	7	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1 p. 27.
Congdon, Leon A	24	21	Rep. Kansas Bd. Health, 1914, p. 100.
Frary, Guy G	147	63	Rep. South Dakota F. & D. Com. 1914, p. 222-223, 263-265, 336.
Ladd, E. F	123	50	Bull. North Dakota Exper. Sta. F. Dept. 1914, v. 3, p. 206-208.
Lythgoe, Hermann C	195	15	Rep. Massachusetts Bd. Health, 1913, 1914, p. 418.
Newcomb, George D	12	5	Proc. Iowa Pharm. Assoc. 1914, p. 28.
Porter, C. S	29	20	Proc. Kentucky Pharm. Assoc. 1914, p. 111.
Sayre, L. E	9	5	Bull. Kansas Bd. Health, 1914, v. 10, p. 25, 173.
Strode, Sylvanus E	5	3	Rep. Ohio D. & F. Div. 1914, p. 118.
Sudro, W. F	79	0	Rep. North Dakota F. Com. 1914, p. 34.
Todd, A. R	49	15	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R	48	14	Bull. Michigan D. & F. Dept. 1914, January-February, p. 17, March-April, p. 19, May-June, p. 27, September-October, p. 16, November-December, p. 22.
Wiedemann, H. E	63	32	Rep. Missouri F. & D. Com., 1914, p. 25-26.
Woods, Chas. D	59	33	Off. Insp. Maine Agric. Exper. Sta. 1914, No. 61, p. 92-93.

Carnot and Cairis: The comparative toxicity of camphor in different solvents.—Compt. rend. Soc. biol. 1914, v. 77, p. 162–163. See also Cairis, Valantine: J. Pharm. Chim. 1914, v. 10, p. 224, and abstract: Pharm. J. 1914, v. 93, p. 457.

Plant, O. H.: Experiments on the cardiac action of camphor.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 513, and p. 571–601.

Edsall and Means: The effect of camphor and other drugs on the respiration and respiratory metabolism in normal human subjects.—Arch. Int. Med. 1914, v. 14, p. 897–910.

Markevitch, M. S.: Large doses of camphor in pneumonia.—(Russky Vrach, v. 13, June 27, No. 24) J. Am. M. Assoc. 1914, v. 63, p. 2081. See also Editorial: New York M. J. 1914, v. 100, p. 980, and v. 99, p. 441.

Alexander, B.: The systematic injection of camphor in pulmonary tuberculosis.—J. Am. M. Assoc. 1914, v. 62, p. 419.

Heiser, Victor G.: Report of two cases of leprosy with apparent cure following treatment by a mixture of chaulmoogra oil, resorcin, and camphorated oil.—Public Health Rep. 1914, v. 29, p. 21–22.

Rosenbloom, Jacob: Gum camphor as a preservative for urine.—New York M. J. 1914, v. 99, p. 735–736.

For additional references see Index Med.; Zentralbl. Exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

CANNABIS INDICA.

U. S. P. IX: The drug freed from the thicker stems and large foliage leaves, and with not more than 10 per cent of mature fruits.

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Description somewhat elaborated. Ash not exceeding 15 per cent.—J. Am. Pharm. Assoc. 1914, v. 3 p. 368, and Abstr. Prop. Changes, Part 2, 1914, p. 10.

Anon.: Illustrated description of cannabis indica, with some consideration of the structural characteristics found in powdered cannabis indica.—Southern Pharm. J. 1914, v. 6, p. 404–405, 448–449.

Roberts, J. G.: Considerable effort is being made to raise domestic cannabis that will equal cannabis indica in phsyiological activity.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 132.

Patch, E. L.: East Indian cannabis indica contained 12.2 per cent of ether soluble resin. American drug consisted of leaves only.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Smith, Kline & French Co.: The tops of American cannabis indica contain from 10 to 12 per cent of seeds, and physically test 80 per cent of the Bombay variety.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Maines, E. L.: Cannabis indica was found to contain from 14 to 20.89 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Rippetoe, J. R.: Nine samples of cannabis indica were found to contain from 12.30 to 16.35 per cent of alcohol extract, 13.20 to 14.70 per cent of ash, and from 2.55 to 9.40 per cent of seeds.—Am. J. Pharm. 1914, v. 86, p. 437.

Mann, E. W.: One of the three samples of cannabis indica examined failed to reach the minimum limit of 12½ per cent fixed by the new Ph. Brit. V for matter soluble in alcohol (90 per cent). The results obtained were: Material soluble in alcohol (90 per cent) from 10.9 to 13.3 per cent; resin, 7.4 to 10.3 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 10.

Baker, W. L.: The resin content of American cannabis was low, 6.5 per cent.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Vanderkleed, C. E.: Reports one sample of cannabis indica, found to contain 13 per cent resin; above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Glücksmann, O.: Some new identification reactions for extract of cannabis indica.—Pharm. Praxis, 1913, v. 12, p. 465–471.

Wester, D. H.: A sample of extract of cannabis indica was not entirely soluble in ether and was evidently adulterated.—Pharm. Weekblad, 1914, v. 51, p. 1440.

Anon.: American cannabis is similar to the imported save in strength, being somewhat less active and given in larger doses.—Am. Druggist. 1914, v. 62, p. 368; also Phys. Drug. News, 1914, v. 9, p. 363.

Vanderkleed, C. E.: All lots of cannabis must be tested. We have examined lots of all varieties which have possessed little or no activity.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 133.

Hare, H. A.: The use of cannabis indica in therapeutics, is handicapped by its frequent lack of power. Only a preparation that has

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been physiologically tested should be used.—Med. Rec. 1914, v. 86, p. 824.

Doerschuk, Albert N.: Cannabis indica should be given in bulky dilutions only. Pills and tablets containing cannabis indica, and fluid preparations given in drop doses have frequently been known to quickly cause marked untoward effects.—Meyer Bros. Drug. 1914, v. 35, p. 328.

CANTHARIS.

U. S. P. IX.: Description somewhat elaborated. Ash not exceeding 9 per cent. When assayed by the process given should give not less than 0.6 per cent of cantharidin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 369, 988, and Abstr. Prop. Changes, Part 2, 1914, p. 11, Part 4, p. 5.

Anon.: Cantharides has been left out of the Ph. Brit. but replaced by its active principle.—Lancet, 1914, v. 187, p. 907; also Chem. & Drug. 1914, v. 85, p. 487.

Arends, Georg: Cantharidin may advantageously be substituted for cantharides in practically all of the galenical preparations, including the plaster, oil, and ointment.—Apoth.-Ztg. 1914, v. 29, p. 986.

Tunmann, O.: The imports of cantharides into Hamburg aggregate in the neighborhood of 7,000 kilograms, and more than 12,000 kilograms leave that port for other countries.—Apoth.-Ztg. 1914, v. 29, p. 100.

Gehe & Co.: The available supply of genuine cantharides has not been sufficient to cover the demand.—Handelsbericht, 1914, p. 58.

Tunnmann, O.: The microchemical detection of cantharidin, with illustrations.—Handelsbericht, Gehe & Co., 1914, p. 177–183.

Fernau, Albert: An assay process for cantharides should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 241.

Caesar & Loretz: The Fromme modification of Boudin's assay method for cantharides and the requirements for this product in the several pharmacopœias. Six samples of cantharides were found to contain from 0.857 to 1.285 per cent of cantharidin.—Jahres-Ber. 1914, p. 37, 54–56.

Hankey, William T.: The three samples of powdered cantharides were found to contain from 0.75 to 0.82 per cent of cantharidin.—Proc. Ohio Pharm. Assoc. 1914, p. 49.

Vanderkleed, C. E.: Reports five assays of Russian cantharides, found to vary from 0.75 to 1.06 per cent of cantharidin.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

E'we, G. E.: The 18 lots of cantharides, Chinese variety, examined varied between 0.11 and 1.95 per cent cartharidin, the average being 1.16 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 133.

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Rippetoe, J. R.: Three samples of cantharides were found to contain from 4.88 to 7.21 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 437.

Maines, E. L.: Cantharides (Russian) was found to contain 6.61 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Gadamer, J.: The constitution of cantharidin.—Arch. Pharm. 1914, v. 252, p. 609–663.

Danckwortt, P. W.: Cantharidin, isocantharidin, and isocantharidinic acid.—Arch. Pharm. 1914, v. 252, p. 663–682.

U. S. P. IX: In making tincture of cantharides, the drug is to be macerated with the alcohol in a container fitted with a reflux condenser (upright glass tube) at a temperature of from 50 to 55° during 24 hours, with frequent agitation. The mixture is then transferred to a percolator and 100 cc. of percolate obtained.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1576–1577, and Abstr. Prop. Changes, Part 6, 1914, p. 14–15.

Scoville, Wilbur L.: A further note on tincture of cantharides, with a report of observations on the value of various menstrua used.—J. Am. Pharm. Assoc. 1914, v. 3, p. 631–634.

Formi, Gherado: On the natural resistance to the local irritation produced by cantharides.—Arch. farmacol. sper. 1914, v. 18, p. 107–114.

CAPSICUM.

U. S. P. IX: The fruit may include not more than 2 per cent of stems, calyxes, and other foreign matter. Total ash not exceeding 7 per cent. Ash insoluble in hydrochloric acid not exceeding 1 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 369, and Abstr. Prop. Changes, Part 2, 1914, p. 11.

Anon.: An illustrated description of capsicum; the variations in the seed pod of the different varieties and the structural characteristics found in powdered capsicum.—Southern Pharm. J. 1914, v. 6, p. 449–450.

Baker, W. L.: Cayenne pepper was found to be high in ash content, total ash being 9.86 per cent and HCl insoluble ash 5.6 per cent.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Rippetoe, J. R.: Four samples of capsicum were found to contain from 17.02 to 24.46 per cent of alcohol extract and from 4.87 to 7 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 437.

J. D. Riedel, A.-G.: Capsicum contained from 4.5 to 6.6 per cent of ash and from 31.9 to 35.3 per cent of extract soluble in alcohol.—Riedel's Berichte, 1914, p. 32.

Maines, E. L.: Capsicum was found to contain from 5.10 to 6.96 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

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Mann, E. W.: The ash content of three samples of the entire fruit of capsicum was found to be, respectively, 4.50, 4.71, and 5.54 per cent. The ash content of the two samples of the powder was found to be 7 and 6.04 per cent (Ph. Brit. maximum 7 per cent).—Ann. Rep. Southall Bros. & Barclay, 1914, p. 10.

Vanderkleed, C. E.: Reports 15 assays of capsicum, found to vary from 13 to 18 per cent of oleoresin; all above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

U. S. P. IX: Ether to replace acetone for making the oleoresin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 551, and Abstr. Prop. Changes, Part 3, 1914, p. 28.

Patch, E. L.: Reports oleoresin of capsicum as insoluble in ether, only slightly soluble in alcohol, and nearly soluble in water. The sample was worthless as oleoresin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1289.

E'we, G. E.: The four samples of oleoresin capsicum examined were pungent in dilutions of 1:150,000, our standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 152.

Editorial: Capsicum at one time was the most important medicine in the Thomsonian practice.—Eclectic M. J. 1914, v. 74, p. 324.

Williams, Thomas T.: In the treatment of malaria with quinine it has been found that if capsicum is added where the secretions are not efficient the patient recovers more rapidly with less quinine.—Ellingwood's Therap. 1914, v. 8, p. 135.

CARBO ANIMALIS.

Ditmar, Rudolf: The production of animal charcoal.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 526; also J. Pharm. Elsass-Lothr. 1914, v. 41, p. 293, and Pharm. Post, 1914, v. 47, p. 951–952.

Nagel, Oskar: The regeneration of animal charcoal.—Ztschr. ang. Chem. 1914, v. 27, p. 488.

Helch, Hans: Some of the uses of animal charcoal in therapy as an absorbent medium in the treatment of intestinal disorders.—Pharm. Post, 1914, v. 47, p. 949–951.

Anon.: Excellent results have been obtained with animal charcoal in diarrhea, enteritis, and severe cases of mineral poisoning.—Critic and Guide, 1914, v. 17, p. 235.

CARBO LIGNI.

Anon.: The best charcoal is derived from young willow shoots.—Southern Pharm. J. 1914, v. 6, p. 450.

Havenhill, L. D.: Carbo ligni of the western market, with a table showing the source of the product. The percentage of ash in 18 samples varied from 0.62 to 16.80.—Drug. Circ. 1914, v. 58, p. 260.

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Hankey, William T.: Of 14 samples of wood charcoal examined, 9 were rejected.—Proc. Ohio Pharm. Assoc. 1914, p. 46.

Maines, E. L.: Charcoal was found to contain 6.21 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Mann, E. W.: Of 10 samples of wood charcoal tested, 2 proved to be very earthy, yielding 25.3 and 11.2 per cent of ash, respectively.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 11.

Wills, E. F.: Straw charcoal, a cheap absorbent and aseptic dressing for wounds, used by the Japanese.—Brit. M. J. 1914, v. 2, p. 541.

Rénon, Richet, and Lépine: A preliminary note on the antiseptic properties of colloidal charcoal.—Compt. rend. Soc. biol. 1914, v. 76, p. 66.

Apple, Franklin M.: For administering charcoal to children, crushed charcoal tablets were found to be most satisfactory.—J. Am Pharm. Assoc. 1914, v. 3, p. 231.

CARBON DIOXIDE.

Anon.: The normal boiling point of carbonic acid has been determined by Henning as −78.53°.—Nature, 1914, v. 93, p. 16.

Tuchler, A. S.: Carbon dioxide ice in skin cancer.—Ellingwood's Therap. 1914, v. 8, p. 9–10. See also Am. J. Clin. Med. 1914, v. 21, p. 633–634; and Foster, George S., p. 999–1000.

Ferris, Albert Warren: A brief outline of the carbon dioxide bath and its uses.—Med. Rec. 1914, v. 86, p. 107–109. See also Brandenberg and Laquer: Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 194–216.

CARBONEI DISULPHIDUM.

Alcock, F. H.: The place of carbon disulphide in official pharmacy and suggestions for its further use.—Pharm. J. 1914, v. 92, p. 133–134; also Year-Book of Pharmacy, 1914, p. 399–401.

Evans, E. V.: The removal of carbon disulphide from coal gas.—Pharm. J. 1914, v. 93, p. 846.

Anon.: A description of Carpenter's process for purifying gas from sulphur compounds.—J. Ind. & Eng. Chem. 1914, v. 6, p. 262.

Seelye, Hiram H.: Carbon disulphide as a therapeutic agent.—New York M. J. 1914, v. 99, p. 437–439.

CARDAMOMUM.

U. S. P. IX: The dried seeds which should be kept in the capsules until wanted for use. Description elaborated. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 369, and Abstr. Prop. Changes, Part 2, 1914, p. 11.

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Editorial: The proposed standard for cardamom seed requires that the dealer supply a drug for which the U. S. P. does not furnish a standard.—Pract. Drug. 1914, v. 32, p. 186.

Anon.: An illustrated description of cardamom, with some reference to the use of cardamom as an aromatic.—Southern Pharm. J. 1914, v. 6, p. 450–451.

Anon.: An illustrated description of Bengal cardamoms.—Brit. & Col. Drug. 1914, v. 65, p. 39.

Gehe & Co.: The reduced production of cardamom in Ceylon is due to the decrease in acreage and reduced yield due to exceptionally dry weather.—Handelsbericht, 1914, p. 78.

Alsberg, C. L.: Cardamom should contain not less than 64 per cent of sound cardamom seed and not more than 36 per cent of inert material, including the pods; ash of the whole fruit not to exceed 8 per cent.—S. R. A.-Chem. 1914, p. 529; also Drug. Circ. 1914, v. 58, p. 545, and Oil, Paint & Drug Rep. 1914, v. 85, July 27, p. 11.

Rippetoe, J. R.: Four samples of decorticated cardamom seed were found to contain from 3.20 to 6.02 per cent of alcohol extract and from 4.55 to 6.11 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 437.

Roberts, J. G.: One sample of decorticated cardamom examined was found to contain 3 per cent of volatile oil and yielded 6.11 per cent of ash.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 132.

E'we, G. E.: One sample of powdered cardamom seed assayed 8.49 per cent ash.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

Maines, E. L.: Cardamom was found to contain from 4.92 to 7.49 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Mann, E. W.: Two of the twenty-five samples of cardamom seeds tested for ash gave abnormal results. The figures 12.39 and 11 per cent, respectively, were so high as to indicate intentional adulteration. For the remaining samples, from 3.12 to 7.15 per cent were the results obtained.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 10.

J. D. Riedel, A.-G.: Cardamom contained from 7.2 to 9.2 per cent of ash and from 7.6 to 8.8 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

Hommell, P. E.: The Dublin College years ago omitted the cochineal in the formula for compound tincture. The same should be done in the U. S. P., as it has no value.—Merck's Rep. 1914, v. 23, p. 159.

McCutcheon, Alexander: The decoloration of compound tincture of cardamom by strontium bromide.—Pharm. J. 1914, v. 92, p. 698.

Amos, W. S.: The compound spirit of cardamom, N. F. made May 15, 1912, has darkened slightly and contains a slight precipitate. The taste suggests pimenta. A sample of spirit using oil of pimenta was a superior mixture.—J. Am. Pharm. Assoc. 1914, v. 3, p. 322.

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CARUM.

U. S. P. IX: Mericarps usually separated, crescent shaped. Description elaborated. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 370, and Abstr. Prop. Changes, Part 2, 1914, p. 12.

Anon.: An illustrated description of caraway, with some reference to its use as an aromatic.—Southern Pharm. J. 1914, v. 6, p. 451, 518.

Gehe & Co.: Table showing the acreage and yield of caraway in Holland during the years 1904–1913, inclusive.—Handelsbericht, 1914, p. 78.

Plahl, Wilhelm: In the detection of extracted caraway considerable reliance is placed on the odor and taste of individual seed.—Arch. Chem. Mikros. 1914, v. 7, p. 209–211.

Maines, E. L.: Caraway was found to contain from 5.93 to 6.82 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Rippetoe, J. R.: One sample of caraway was found to contain 20.88 per cent of alcohol extract and 6.94 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 437.

J. D. Riedel, A.-G.: Caraway contained from 6.1 to 7.9 per cent of ash, and from 27.5 to 31 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Mann. E. W.: Of five samples of caraway tested for ash one yielded 13 per cent, indicating excessive contamination with earthy matter. For the remaining four the figures obtained ranged from 6.3 to 7.6 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 10.

CAROPHYLLUS.

U. S. P. IX: The dried flower bud with not more than 5 per cent of the peduncles, stems, and other foreign matter. Total ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 370, and Abstr. Prop. Changes, Part 2, 1914, p. 12.

Gehe & Co.: The economic conditions of the clove market, with tables showing the production of cloves in Zanzibar and Pemba in the years 1898 to 1912, inclusive.—Handelsbericht, 1914, p. 59–60. See also Schimmel & Co.: Semi-Ann. Rep. 1914, p. 47; and Roure-Bertrand Fils: Sc. & Ind. Bul. April, 1914, p. 42.

Anon.: An illustrated description of cloves with references to the adulterants that have been found and the uses to which the drug has been put.—Southern Pharm. J. 1914, v. 6, p. 518–519.

Maines, E. L.: Cloves were found to contain from 5.25 to 5.54 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Rippetoe, J. R.: Two samples of cloves were found to contain 5.99 and 5.50 per cent of ash; one sample contained 16.20 per cent of alcohol extract.—Am. J. Pharm. 1914, v. 86, p. 438.

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J. D. Riedel, A.-G.: Cloves contained from 5.4 to 7.3 per cent of ash, and from 29.8 to 33.9 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Hortvet, Julius: Of 67 samples of cloves examined, 14 were reported illegal.—Rep. Minnesota D. & F. Com. 1914, p. 68.

Parry, Ernest J.: The adulteration of cloves, with a table showing the constituents of some of the worst samples observed.—Merck's Rep. 1914, v. 23, p. 31.

CERA ALBA.

News Note: Use of ozonized air to whiten beeswax.—J. Soc. Chem. Ind. 1914, v. 33, p. 651.

Helch, Hans: The saponification of white wax should be conducted on a sand bath or on a wire netting.—Pharm. Post, 1914, v. 47, p. 571.

Dück: A sample of white wax was adulterated with stearin and had a melting point of 59.5°. The alcoholic solution was acid with litmus paper.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 234.

E'we, G. E.: Five lots of white wax examined had melting points ranging from 63 to 64.5°, all being very close to the U. S. P. limits of 64 to 65°.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 159.

Mann, E. W.: Seventeen samples of white beeswax varied in specific gravity from 0.961 to 0.969; melting point from 62° to 64°; acid value from 17.6 to 22.5; ester value from 74.5 to 77.6.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 8.

Jensen, H. R.: Eighteen samples of white wax were found to melt at from 62.5 to 63°, and to have an acid value of from 21 to 23, saponification value from 97 to 99, and ester value from 74 to 78.—Evans' An. Notes, 1914, p. 12.

CERA FLAVA.

Tunmann, O.: Table showing the amount of wax imported annually into Hamburg and the origin of the drug.—Apoth.-Ztg. 1914, v. 29, p. 100–101.

Noyes, C. R.: You can have beeswax or beeswax compound. You usually have a beeswax compound which contains anywhere from 2 to 70 per cent paraffin wax.—J. Am. Pharm. Assoc. 1914, v. 3, p. 855; also Proc. Minnesota Pharm. Assoc. 1914, p. 192.

Linke, H.: The Ph. Germ. V method for the determination of the ester number of wax gives misleading results; the method outlined by Berg-Bohrisch is more satisfactory.—Apoth.-Ztg. 1914, v. 29, p. 489. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 239.

Bohrisch, P.: The Ph. Germ. V upper limit of acid number is too high. Twenty-two would be nearer correct.—Apoth.-Ztg. 1914, v. 29, p. 901; also Pharm. Zentralh. 1914, v. 55, p. 893–895.

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Fischer, Hanns: Critical observations on beeswax and the analyses of commercial samples.—Apoth.-Ztg. 1914, v. 29, p. 985; also Pharm. Zentralh. 1914, v. 55, p. 1017–1019, and Ztschr. öffentl. Chem. 1914, v. 20, p. 318–321. See also a reply by Buchner, 349–351; and Fischer, 409–415.

Heinze, Karl: A study of the economic condition of beeswax and the methods of analysis.—Seifensieder Ztg. 1914, v. 41, p. 1234–1235, 1255–1257. See also Buchner and Deckert, p. 1302–1303, 1324–1325.

Bohrisch, P.: A review of some of the recent literature on the analysis of beeswax.—Pharm. Zentralh. 1914, v. 55, p. 969–970.

Hervig, W.: Review of progress in the chemistry of fats, oils, and waxes.—Chem. Rev. Fett u. Harz Ind. 1914, v. 21, p. 44–47, 75–78, 99–102, 132–134, 183–187, 207–208, 213–215, 219–222, 229–232.

Dobbie and Fox: The composition of some medieval wax seals.—J. Chem. Soc. Lond. 1914, v. 105, p. 795–800. See also Sebelien, John: Ztschr. ang. Chem. 1913, v. 26, p. 689–692.

E'we, G. E.: The seven lots of yellow wax examined had melting points ranging from 61.5 to 65°. The U. S. P. limits are 62 to 64°.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 159.

Mann, E. W.: The specific gravity of the normal samples of beeswax varied from 0.958 to 0.970; melting point from 61.5 to 64°; acid value from 17.5 to 20.8; ester value from 67.3 to 76.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 8.

Mansfeld, M.: Of five samples of wax examined three were inferior products.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 68, p. 525.

Jensen, H. R.: Of 38 samples of yellow wax examined 4 were found to be adulterated.—Evans's An. Notes, 1914, p. 12.

For additional references on wax see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

CERATA.

U. S. P. IX: Ceratum to be made from white wax and benzoinated lard.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1567, and Abstr. Prop. Changes, Part 6, 1914, p. 5.

Curry, Gordon L.: The six official cerates are all easily made, even by a novice.—Proc. Kentucky Pharm. Assoc. 1914, p. 57.

Raubenheimer, Otto: Do not dispense cerates and ointments when rancid, because they are very irritating.—J. Am. Pharm. Assoc. 1914, v. 3, p. 974.

CETACEUM.

Tunmann, O.: The spermaceti imported into Hamburg comes mainly from England and North America, and in turn is distributed to Russia, Austria, and Switzerland.—Apoth.-Ztg. 1914, v. 29, p. 101.

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Mann, E. W.: In our opinion, the lower limit for saponification value given in the 1914 Ph. Brit. is rather too high. We have obtained 122 or 123 for samples of undoubted genuineness.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 23.

CHLORALFORMAMIDUM.

Williams, Joseph H.: The manufacture of chloral formamide.—Pharm. J. 1914, 4, 93, p. 293.

Anon.: Chloralamide is prepared by mixing anhydrous chloral with formamide at ordinary temperatures and allowing to crystallize. The formamide can be obtained by distilling ammonium formate.—Southern Pharm. J. 1914, v. 7, p. 60.

Becker, Henry C.: In the treatment of epilepsy, chloralamide, 45 grains per dose, or 90 grains a day, is very useful at times in certain cases.—Merck's Arch. 1914, v. 16, p. 36.

CHLORALUM HYDRATUM.

Williams, Joseph H.: The manufacture of chloral hydrate.—Pharm. J. 1914, v. 93, p. 293. See also Southern Pharm. J. 1914, v. 7, p. 60.

Fernau, Albert: The melting point of chloral hydrate can not be determined absolutely and melting ranges from 53 to 56° should be permitted.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 241.

E'we, G. E.: One lot of chloral hydrate examined contained negligible traces of chlorides, but was otherwise of U. S. P. quality.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

Lintner and Lüers: The reduction of hydrated chloral by means of yeast in the course of alcoholic fermentation.—Ztschr. physiol. Chem. 1914, v. 88, p. 122–123.

Coppin and Titherley: The condensation of chloral hydrate and carbamide.—J. Chem. Soc. Lond. 1914, v. 105, p. 32–36.

Beckman and Maxin: Chloral hydrate and bromal hydrate as cryoscopic or ebullioscopic solvents.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2875–2880.

Lascoff, J. Leon: The official narcotic preparations, with a table enumerating the National Formulary preparations containing chloral hydrate or cannabis indica.—Drug. Circ. 1914, v. 58, p. 454.

Puckner, W. A.: A report on Bromidia points out the dangerous character of this and related mixtures.—Rep. Council Pharm. Chem. 1914, p. 15–20.

Frankforter and Kritchevsky: The action of chloral, chloral hydrate and bromal on certain organic compounds in the presence of aluminium chloride.—J. Am. Chem. Soc. 1914, v. 36, p. 1511–1529.

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Law, W. F.: Treatment of tetanus. Full dose of hydrated chloral followed by sufficient of the drug to keep the patient constantly under its influence and free from spasms.—Brit. M. J. 1914, v. 2, p. 877.

Roch and Cottin: Intravenous injection of chloral in the treatment of tetanus was successfully employed in a boy, age 13. An Abstract.—Med. Rec. 1914, v. 86, p. 572.

Becker, Henry C.: Hydrated chloral is considered a specific adjuvant in the treatment of epilepsy.—Merck's Arch. 1914, v. 16, p. 36.

CHLOROFORMUM.

Anon.: The normal freezing point of chloroform has been determined by Henning as −63.7°.—Nature, 1914, v. 93, p. 16.

Fernau, Albert: The water content of chloroform should be recognized and restricted.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 241.

Linke, H.: The Ph. Germ. V requirements for chloroform for narcosis might also be required of the chloroform for pharmaceutical purposes.—Apoth.-Ztg. 1914, v. 29, p. 683.

Richter, Ernst: Three samples of chloroform for anesthesia did not comply with the formaldehyde sulphuric acid test.—Apoth.-Ztg. 1914, v. 29, p. 211.

Scoville, W. L.: Some lots of chloroform contained chlorine compounds and organic bodies, which modified the odor and made it unfit for use.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Brown, Lucius P.: Of four samples of chloroform examined one was found to be illegal.—Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.

E'we, G. E.: Of seven samples of chloroform examined, four were strictly U. S. P. The other three samples left disagreeable odors on evaporation and contained slight traces of substances decomposable by sulphuric acid.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

Roberts, J. G.: Of eight lots examined, one was rejected on account of the presence of chlorides.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

Baker, W. L.: Chloroform, in bottles of 100 gm., was found to vary from 68.7 to 94 gm. in weight.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Dorronsoro and Fernández: The detection of the presence of acetone in commercial chloroform.—Farm, Espan. 1914, v. 46, p. 401–403.

Enz, K.: Observations on the miscibility of chloroform and of alcohol.—Pharm. Zentralh. 1914, v. 55, p. 954–955.

U. S. P. IX: For aqua chloroformi to direct the use of recently boiled distilled water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, Part 3, 1914, p. 2.

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Editorial: Chloroform is a useful preservative for water dispensed medicine. If used sparingly it is agreeable to most persons.—Eclectic M. J. 1914, v. 74, p. 659.

Barton, P. F.: To avoid mistaking chloroform for ether, it is suggested to have chloroform colored red and ether colored green.—Lancet, 1914, v. 187, p. 60. See also Clark, W. Inglis: Year-Book of Pharmacy, 1914, p. 416–417; and Editorial: Pharm. J. 1914, v. 92, p. 42.

J. D. Riedel, A.-G.: Recent reports of untoward results from the use of chloroform and combinations of chloroform and morphine in anesthesia.—Riedel's Berichte, 1914, p. 68.

Guy, W.: Death may occur with either an overdose or an underdose of chloroform. Chloroform is the most unsuitable and dangerous of anesthetics so far as dental operations are concerned.—Dental Cosmos, 1914, v. 56, p. 1294.

Fairlie, H. P.: A case of delayed chloroform poisoning. A young woman, 24, after an operation under chloroform vomited a small quantity of brownish fluid. Fifty-three hours after the operation she began behaving in a peculiar manner and sixty-five hours after the operation vomited at frequent intervals. Death took place nine hours later.—Lancet, 1914, v. 187, p. 1411–1412.

Guthrie, Leonard: Sir James Y. Simpson and anesthetics.—Lancet, 1914, v. 187, p. 1118. See also Powell, R. Douglas, p. 1166.

MacWilliam, J. A.: Cardiac fibrillation and its relation to chloroform and anesthesia.—Brit. M. J. 1914, v. 2, p. 499–500.

Githens and Meltzer: The irritability of motor nerves in chloroform anesthesia.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 523.

Buck, Leonard W.: Effects of chloroform and of ether anesthesia on the protein contents of the blood serum of rabbits.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 553–557.

Whiting, Maurice H.: Anesthetics in eye work.—Brit. M. J. 1914, v. 2, p. 471. See also Marshall, C. Devereux; also Traquair, H. M., p. 541; and Butler, T. Harrison, p. 716.

Lawrie, E.: The action of chloroform. The work of the Hyderbad Commission.—Brit. M. J. 1914, v. 2, p. 605.

Moriarty, George: The position of chloroform as an anesthetic. No method of administering chloroform is entirely free from risk.—Brit. M. J. 1914, v. 1, p. 791–792.

Fairlie, H. P.: A comparison of the actions of chloroform and ether on the blood pressure.—Lancet, 1914, v. 186, p. 603–606. See also Walton, Albert, p. 714; and Smith, G. McCall, p. 784–785.

Bacon and Barsony: On the action of chloroform and of ether narcosis on the motor function of the stomach.—Arch. ges. Physiol. 1914, v. 158, p. 464–477.

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Opie and Alford: The influence of diet on hepatic narcosis and toxicity of chloroform.—J. Am. M. Assoc. 1914, v. 62, p. 895–896. See also v. 63, p. 136.

CHONDRUS.

U. S. P. IX: The entire plants more or less matted together. Description elaborated, including a description of the utility.—J. Am. Pharm. Assoc. 1914, v. 3, p. 371; and Abstr. Prop. Changes, Part 2, 1914, p. 13.

Anon.: An illustrated description of chondrus.—Southern Pharm. J. 1914, v. 6, p. 547–548.

Tunmann, O.: A review of the origin of carregeen.—Apoth.-Ztg. 1914, v. 29, p. 91.

Caesar & Loretz: The valuation of Irish moss includes the determination of moisture content, ash content, and tests for sulphurous acid.—Jahres-Ber. 1914, p. 56.

Maines, E. L.: Irish moss was found to contain from 16.61 to 17.64 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

CHROMII TRIOXIDUM.

Mann, E. W.: One sample of chromic acid only was sufficiently pure to comply with the requirements of the Ph. Brit. 1898. It contained 98.85 per cent of chromium trioxid (CrO_3), and was practically free from sulphates. Six other samples yielded from 81 to 84.6 per cent CrO_3.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 44.

CHRYSAROBINUM.

Bailey, E. Monroe: Some reactions of chrysophanic acid, with reference to its detection in complex medicinal preparations.—J. Ind. & Eng. Chem. 1914, v. 6, p. 320–321.

Fox, Howard: Obstinate cases of psoriasis that have long resisted vigorous treatment with chrysarobin ointment will often yield to this remedy when injections of autogenous serum are given.—J. Am. M. Assoc. 1914, v. 63, p. 2190–2194.

CIMICIFUGA.

U. S. P. IX: The drug may include not more than 2 per cent of the stems and other foreign matter. Description somewhat elaborated. Ash not exceeding 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 371; and Abstr. Prop. Changes, Part 2, 1914, p. 13.

Stanaland, H. G.: Manufacturers or dealers frequently label cimicifuga "cohosh" or "macrotys."—Drug. Circ. 1914, v. 58, p. 349.

Anon.: An illustrated description of cimicifuga, with some comments on its uses.—Southern Pharm. J. 1914, v. 7, p. 25–26.

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Lloyd, John Uri: Characteristics and constituents of macrotys.—Eclectic M. J. 1914, v. 74, p. 227.

Rippetoe, J. R.: Two samples of cimicifuga were found to contain 12.20 and 6.43 per cent of alcohol extract, and 9.30 and 8.93 per cent of ash, respectively.—Am. J. Pharm. 1914, v. 86, p. 438.

Hankey, William T.: One lot of black cohosh rejected contained 23 per cent of ash.—Proc. Ohio Pharm. Assoc. 1914, p. 54.

U. S. P. IX: One gm. of the powdered extract to represent 4 gm. of the drug. Dried starch to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 534; and Abstr. Prop. Changes, Part 3, 1914, p. 11.

Anon.: Cimicifuga is a component of quite a number of the proprietary "female remedies."—Southern Pharm. J. 1914, v. 7, p. 26.

Fisk, F. H.: Macrotys is one of the oldest of botanical remedies. It is frequently referred to in eclectic literature.—Ellingwood's Therap. 1914, v. 8, p. 141–142.

Ellingwood, Finley: Macrotys racemosa is the plant commonly known as black cohosh; it also bears the older botanical name of cimicifuga racemosa.—Am. J. Clin. Med. 1914, v. 765–769.

Alderman, Theodore Davis: In ovarian neuralgia, cimicifuga is called for.—Eclectic M. J. 1914, v. 74, p. 7.

Editorial: The action of macrotys in the treatment of dysmenorrhea and amenorrhea should be emphasized.—Ellingwood's Therap. 1914, v. 8, p. 195.

CINCHONA.

U. S. P. IX: Description elaborated. Qualitative test added. To assay not less than 6 per cent of the total alkaloids of cinchona.—J. Am. Pharm. Assoc. 1914, v. 3, p. 372, 989, and Abstr. Prop. Changes, Part 2, 1914, p. 14, Part 4, p. 6.

Schwartz, J.: The history of cinchona, a review.—Eclectic M. J. 1914, v. 74, p. 511.

Anon.: An illustrated description of the cinchona plant, the official barks and the structural characteristics of the bark.—Southern Pharm. J. 1914, v. 7, p. 26–28, 76.

Gehe & Co.: Table showing the amount of cinchona bark offered for sale and sold in the Amsterdam market during 1913.—Handelsbericht, 1914, p. 66. See also Brit. & Col. Drug. 1914, v. 65, p. 40.

Einbreck, Hans: Progress in the chemistry of the cinchona alkaloids in 1913.—Fortschr. Chem. 1914, v. 9, p. 189.

Watson, G. N.: A new test for cinchona alkaloids.—Drug. Circ. 1914, v. 58, p. 14.

Perrot and Huber: The evaluation of the cinchonas cultivated in Madagascar.—Bull. sc. pharmacol. 1914, v. 21, p. 257–263; also Pharm. Weekblad, 1914, v. 51, p. 841–847.

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Kollo, K.: The composition of the root barks of the cinchonas.—Pharm. Zentralh. 1914, v. 55, p. 62–63.

Dufilho, E.: The volumetric determination of alkaloids in cinchona and its galenical preparations.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 53–59.

Anon.: The second supplement to the Ph. Ndl. IV outlines a modified titration method for the assay of alkaloids in cinchona. The titration is in solution, using methyl red as an indicator.—Pharm. Post, 1914, v. 47, p. 126.

Linke, H.: The Ph. Germ. V method of assay for cinchona with barks containing more than 5 per cent of total alkaloids gives results that are too low.—Apoth.-Ztg. 1914, v. 29, p. 489.

Caesar & Loretz: A review of the assay of cinchona, with a table showing the requirements included in the several pharmacopœias.—Jahres-Ber. 1914, p. 57–60. See also p. 9–11.

Anon.: The assay of quinine in cinchona bark. An abstract from the paper by Broersma.—Chem. & Drug. 1914, v. 84, p. 857.

Neal, P. C.: Of nine samples of cinchona bark examined all were accepted.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

Linke, H.: Two samples of cinchona bark gave 3.55 and 13.65 per cent of ash and 8.96 and 8.30 per cent of total alkaloids.—Apoth.-Ztg. 1914, v. 29, p. 530.

Caesar & Loretz: A total of 37 samples of cinchona were found to vary from 3.49 to 12.22 per cent of alkaloid. Three samples contained from 1.85 to 5.45 per cent of ash.—Jahres-Ber. 1914, p. 37.

Vanderkleed, C. E.: Reports 10 assays of yellow cinchona, found to vary from 5.29 to 9.13 per cent total anhydrous alkaloids; all above standard.—Proc. Pennsylvania Pharm. Assoc. 1914. p. 160.

Meulenhoff, J. S.: The preparation of a fluid extract of cinchona.—Pharm. Weekblad, 1914, v. 51, p. 101–104.

Ramsay, C. F.: In making fluid extracts of cinchona, calisaya, it is found that by not adding the glycerin to the menstruum and reserving the first portion of percolate from each percolator, very good results are obtained.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1647.

U. S. P. IX: To require that 100 cc. of the fluid extract of cinchona yield not less than 4.5, nor more than 5.5 gm. of the total alkaloids of cinchona.—J. Am. Pharm. Assoc. 1914, v. 3, p. 989, and Abstr. Prop. Changes, Part 4, 1914, p. 6.

Caesar & Loretz: Two samples of fluid extract of cinchona were found to contain 4.56 and 5.49 per cent of alkaloid; 2.05 and 2.75 per cent of ash; and 20.5 and 27.65 per cent of extract.—Jahres-Ber. 1914, p. 37.

Wold, Thomson: The uniformity of the alkaloid content in tinctures and in wines of cinchona.—Pharm. Zentralh. 1914, v. 55, p. 43–46.

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Eagon, S. E.: Cinchona is valuable in debility of the stomach and digestive tract, especially if associated with general atony.—Eclectic M. J. 1914, v. 74, p. 512.

Postle, F. D.: The four chief alkaloids of cinchona.—Eclectic M. J. 1914, v. 74, p. 512–513.

CINCHONA RUBRA.

U. S. P. IX: Description elaborated. Qualitative test added. Red cinchona to yield not less than 6 per cent of the total alkaloids of cinchona.—J. Am. Pharm. Assoc. 1914, v. 3, p. 372, 990, and Abstr. Prop. Changes, Part 2, 1914, p. 14, Part 4, p. 7.

Dufilho: Observations on the extraction of the official red cinchona. Sixty per cent alcohol was found to be the most satisfactory menstruum.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 149–157.

J. D. Riedel, A.-G.: Red cinchona contained from 1.9 to 4.6 per cent of ash, from 21.4 to 24.5 per cent of extract soluble in water, and from 27.5 to 37.0 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Maines, E. L.: Cinchona bark, red, was found to contain from 9.30 to 15.07 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Scoville, W. L.: Reports that 12 lots of red chincona yielded from 7.21 to 11.63 per cent of total alkaloids.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Vanderkleed, C. E.: Reports 14 assays of red cinchona, found to vary from 6.83 to 10.18 per cent of total anhydrous alkaloids; all above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 150.

U. S. P. IX: To require that 100 cc. of compound tincture of cinchona yield not less than 0.45 gm., nor more than 0.55 gm. of the total alkaloids of cinchona.—J. Am. Pharm. Assoc. 1914, v. 3, p. 990, and Abstr. Prop. Changes, Part 4, 1914, p. 7.

CINCHONIDINÆ SULPHAS.

Watson, G. N.: Color test for cinchonidine.—Drug. Circ. 1914, v. 58, p. 14.

E'we, G. E.: The one lot of cinchonidine alkaloid examined melted at 206° and was free from moisture.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

Kebler, L. F.: Outline of method for the determination of cinchonidine in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1090.

CINCHONINÆ SULPHAS.

Baker, W. L.: Cinchonine sulphate was found to have a low melting point and to be deficient in chloroform-soluble material.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

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E'we, G. E.: The one lot of cinchonine alkaloid examined was free from chloroform, but contained 0.15 per cent moisture.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

CINNALDEHYDUM.

Phillips, H. Adie: The stability of cinnamic aldehyde.—Pharm. J. 1914, v. 93, p. 129–130; also Year-Book of Pharmacy, 1914, p. 371–374.

Braithwaite, J. O.: A correction of statement made in the paper on cinnamic aldehyde, p. 159.—Pharm. J. 1914, v. 92, p. 214.

Jensen, H. R.: One sample of crude cinnamic aldehyde, derived from cassia oil, had: Specific gravity, 1.055; refractive index, 1.6195; optical rotation, −0.14°.—Evans' An. Notes, 1914, p. 23.

CINNAMOMUM SAIGONICUM.

U. S. P. IX: Description elaborated. Total ash not exceeding 6 per cent. Ash insoluble in diluted hydrochloric acid not exceeding 2 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 372, and Abstr. Prop. Changes, Part 2, 1914, p. 14.

Editorial: Cinnamon trees were introduced into the Seychelles Islands in 1775.—Am. Perf. 1914, v. 9, p. 71.

Anon.: An illustrated description of the cinnamon pressing machine used at the London docks.—Chem. & Drug. 1914, v. 84, p. 393–394.

Maines, E. L.: Saigon cinnamon was found to contain from 3.06 to 5.03 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Jensen, H. R.: A sample of African bark had an ash residue of 3 per cent.—Evans' An. Notes, 1914, p. 23.

Hortvet, Julius: Of 82 samples of cinnamon examined, 10 were reported illegal.—Rep. Minnesota D. & F. Com. 1914, p. 68.

Freund, Hans: The composition of tincture of cinnamon and methods for testing the preparation.—Pharm. Zentralh. 1914, v. 55, p. 265–266.

Editorial: Cinnamon has properties which make it nearly specific for certain conditions.—Eclectic M. J. 1914, v. 74, p. 266–267.

CINNAMOMUM ZEYLANICUM.

U. S. P. IX: Description elaborated. Total ash not exceeding 6 per cent. Ash insoluble in diluted hydrochloric acid not exceeding 2 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 373, and Abstr. Prop. Changes, Part 2, 1914, p. 15.

Anon.: An illustrated article on cinnamon, showing the flowering branch of *Cinnamomum Zeylanicum*, and method of removing the bark, the characteristic features of the several commercial cinnamon

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barks, and the structural characteristics of these barks.—Southern Pharm. J. 1914, v. 7, p. 76–79, 121–122.

Gehe & Co.: Economic conditions of the market in cinnamon and cassia, with a table showing the destination of Ceylon cinnamon.—Hendelsbericht, 1914, p. 64.

Linke, H.: For Ceylon cinnamon an extract content of not less than 13 per cent might be included in the pharmacopœia. Two samples gave, respectively, 14.80 and 14.45 per cent of extract and 3.60 and 4.72 per cent of ash.—Apoth.-Ztg. 1914, v. 20, p. 530.

Rippetoe, J. R.: One sample of Ceylon cinnamon was found to contain 14.33 per cent of alcohol extract and 4.01 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 438.

J. D. Riedel, A.-G.: Ceylon cinnamon contained from 3.3 to 5.2 per cent of ash and from 16.7 to 19.9 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

COCA.

Anon.: An illustrated description of coca, with some reference to the history and uses of coca.—Southern Pharm. J. 1914, v. 7, p. 122–124, 170.

Wilbert, M. I.: Sale and use of cocaine and narcotics, with table showing the quantities of the several drugs entered for consumption in the United States during the years 1910 to 1913.—Public Health Rep. 1914, v. 29, p. 3180–3183.

Baker, W. L.: Coca leaves were found to have deteriorated badly, odor musty, and to contain but 0.09 per cent ether-soluble alkaloids.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Maines, E. L.: Coca leaves were found to contain from 6.22 to 12.07 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Coca leaves contained from 7 to 10.4 per cent of ash, and from 26.7 to 33.4 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, 31.

Caesar & Loretz: The valuation of coca, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 81–83.

Wester, D. H.: The alkaloids of coca in the young leaf are found in the epidermal layer of both the upper and the lower side of the leaf.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 127; also Pharm. Weekblad, 1914, v. 51, p. 231.

de Jong, A. W. K.: The nature and value of the Javanese coca.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 979–981; also Bull. sc. pharmacol. 1914, v. 21, p. 289.

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Vanderkleed, C. E.: Reports 10 assays of coca leaf, found to vary from 0.594 to 1.15 per cent of ether soluble alkaloids; all above standard.—proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

COCAINA.

Kottenhoff, G.: Brief review of the history and commerce of coca and cocaine.—Rev. internat. pharm. Brux. 1913, v. 1, p. 90–93.

American Letter: It is estimated that cocaine to the amount of 150,000 ounces is manufactured annually in the United States.—Chem. & Drug. 1914, v. 85, p. 366.

Wilbert, M. I.: Table showing the quantities of cocaine and narcotics entered for consumption in the United States during the years 1910–1913.—Public Health Rep. 1914, v. 29, p. 3180–3183.

Marden and Elliott: The distribution ratio of cocaine alkaloid between ether and water was found to be very small, in the neighborhood of 0.01.—J. Ind. & Eng. Chem. 1914, v. 6, p. 930.

Pisani, F.: A new reaction for cocaine.—Rend. soc. chim. ital. 1914, v. 6, p. 132–133.

van der Haar, A. W.: A method for the determination of benzoyl in benzoyl derivatives.—Arch. Pharm. 1914, v. 252, p. 205–208.

Kebler, L. F.: Outline of method for the determination of cocaine in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1091.

Bouyer, J.: The incompatibility of sodium borate and cocaine hydrochloride. An illustrated description of the crystals observed.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 64–69.

Anon.: The protocol of the International Opium Convention, including a list of the countries that have signified adherence to the provisions of the protocol.—Rev. Internat. Pharm. Brux. 1914, v. 2, p. 4–7.

Anon.: The possible spread of betel nut chewing as a substitute for the use of cocaine should be warned against.—Lancet, 1914, v. 187, p. 976.

Wallis, James H.: The increase in the use of cocaine in this country is a public scandal.—Proc. Idaho Pharm. Assoc. 1914, p. 13. See also Stallings, R. E.: Proc. Georgia Pharm. Assoc. 1914, p. 52.

Pettey, George E.: Cocaine as a respiratory stimulant.—Merck's Arch, 1914, v. 16, p. 177–179.

Porter, William Henry: The value of cocaine in disturbances of metabolism.—New York M. J. 1914, v. 99, p. 815–819. See also Boston M. & S. J. 1914, v. 170, p. 586–587.

Kochmann, M.: A comprehensive review of anesthetics and pain-relieving remedies, including a graphic presentation of the comparative anesthetic properties and toxic properties of cocaine and other

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substances used as local anesthetics.—Therap. Monatsh. 1914, v. 28, p. 641–653.

Miller, Albert H.: The dosage of cocaine and other drugs used for producing local surgical anesthesia.—J. Am. M. Assoc. 1914, v. 62, p. 196.

Guy, W.: Cocaine or other drugs for spinal anesthesia can find no employment in dental surgery.—Dental Cosmos, 1914, v. 56, p. 1297.

COCAINÆ HYDROCHLORIDUM.

Roques, Ferdinand: The decline in cocaine hydrochloride during 1913 was much more accentuated than that of the coca-leaves, and the year closed at the lowest price on record.—Chem. & Drug. 1914, v. 84, p. 212.

Fernau, Albert: For the successful application of the MacLagan test for foreign coca bases, the temperature should not exceed 50°, and the ammonia be accurately measured.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 241.

Kollo, Konstantin: Ampoules of cocaine hydrochloride should be Tyndallized for three days at 90°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Bouyer, E.: The incompatibility of sodium borate and cocaine hydrochloride.—Bull. soc. pharm. Bordeaux, 1914, v. 54, p. 64–69. See also Pharm. Era, 1914, v. 47, p. 465.

COCCUS.

U. S. P. IX: The dried female insect inclosing her young larvæ. Description elaborated; qualitative chemical test added. Ash not exceeding 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 373, and Abstr. Prop. Changes, Part 2, 1914, p. 15.

Tunmann, O.: Tables showing the Hamburg imports and exports of cochineal from 1898 to 1911, inclusive, the greater portion of the drug coming direct from the Canary Islands. Small quantities come from America by way of London.—Apoth.-Ztg. 1914, v. 29, p. 101.

Caesar & Loretz: The valuation of cochineal includes the determination of moisture content, ash content, and color value.—Jahres-Ber. 1914, p. 56–57.

Patch, E. L.: Reports cochineal to contain 10 per cent of ash, including considerable magnetic iron oxide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Maines, E. L.: Cochineal was found to contain from 3.69 to 13.15 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Hankey, William T.: Of 17 samples of cochineal examined, 8 were rejected.—Proc. Ohio Pharm. Assoc. 1914, p. 53.

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Wester, D. H.: The several pharmacopœias give the melting point of codeine as being from 152° to 155°. Codeine with one molecule of water of crystallization melts at about 153°, while water-free codeine melts at 155°.—Pharm. Weekblad, 1914, v. 51, p. 1440.

Mossler, Gustav: A report of experiments on the production of opium alkaloids from the capsules.—Pharm. Post, 1914, v. 47, p. 483–486.

Marden and Elliott: When using equal volumes of water and ether about as much of the codeine remains in the aqueous layer as goes into the ether layer. Chloroform would remove the codeine as completely as could be desired in the analytical laboratory.—J. Ind. & Eng. Chem. 1914, v. 6, p. 930.

Gsell and Marschalké: The quantitative determination of several opium alkaloids, on the basis of their conversion into their methyl-oxyl-group.—Ztschr. Anal. Chem. 1914, v. 53, p. 675–678.

Gehe & Co.: The concentrated sulphuric acid test for codeine may be misleading unless allowed to stand. Practically every sample of codeine will give a rose red coloration, but this disappears on standing.—Pharm. Zentralh. 1914, v. 55, p. 400.

E'we, G. E.: Of the two lots examined, one was strictly U. S. P., having a melting point of 155° and assaying 5.47 per cent of water. The other sample was effloresced and assayed 104 per cent of the U. S. P. crystallized article.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

Jensen, H. R.: Three samples of codeine had a melting point of from 152° to 155°, and a titration value corresponding to 99.5 per cent.—Evans' An. Notes, 1914, p. 26.

Kebler, L. F.: Outline of method for the determination of codeine in compressed tablets of acetanilide compound.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1082.

Brown, Lucius P.: One sample of codeine tablets examined was found to be illegal.—Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.

Brown, L. A.: Three samples of codeine tablets analyzed; one passed and two adulterated. Samples varied in strength from 106.5 to 58.5 per cent.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Strode, Sylvanus E.: Of seven samples of codeine tablets examined, one was not passed.—Rep. Ohio D. & F. Div. 1914, p. 120.

Mannich and Leemhuis: A number of codeine tablets were found to vary in weight from 0.16 to 0.25 gm. and to contain an average of 0.015 gm. of codeine, in place of 0.05 gm., as claimed.—Apoth.-Ztg. 1914, v. 29, p. 194.

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Anon.: A list of the alkaloids, derivatives, and preparations for which official order blanks will be required in New York under the Boylan law.—Drug Topics, 1914, v. 29, p. 104–105.

Jackson, D. E.: A note on the pharmacological action of opium alkaloids.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 57–72.

Pitini, A.: Pharmacological research on several derivatives of morphine and of codeine.—Ann. chim. applicata, 1914, v. 2, p. 208–213.

Kochmann, M.: The use of codeine and related compounds for relieving pain.—Therap. Monatsh. 1914, v. 28, p. 649.

CODEINÆ PHOSPHAS.

E'we, G. E.: One lot of codeine phosphate examined tested 100.8 per cent of absolute codeine phosphate. As the U. S. P. calls for the crystallized salt with two molecules of water of crystallization, this product was considerably over strength.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 135.

Linke, H.: The Ph. Germ. V requirement for water of crystallization, of codeine phosphate, is not ordinarily complied with by the commercial article. Nine samples examined lost, on drying at 100°, from 6 to 8.20 per cent, only one of these complying with the minimum requirement of the pharmacopœia.—Apoth.-Ztg. 1914, v. 29, p. 683.

CODEINÆ SULPHAS.

Todd, A. R.: Of five samples of tablet triturates of codeine sulphate examined, one was found to be adulterated.—Rep. Michigan D. & F. Com. 1914, p. 176.

Todd, A. R.: One sample of tablet triturates of codeine sulphate examined was found to be adulterated.—Bull. Michigan D. & F. Dept. 1914, May–June, p. 27.

COLCHICI CORMUS.

U. S. P. IX: Description elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 374, and Abstr. Prop. Changes, Part 2, 1914, p. 16.

Anon.: An illustrated description of the flowering plant of *Colchicum autumnale* L.—Chem. & Drug. 1914, v. 84, p. 252. See also Southern Pharm. J. 1914, v. 7, p. 170–173.

Lewis, S. Judd: A fine specimen of dried English corm was found to contain 11.88 per cent of moisture and 1.93 per cent of ash calculated on the completely dried drug.—Pharm. J. 1914, v. 92, p. 126; also Year-Book of Pharmacy, 1914, p. 366–367.

Hankey, William T.: Four samples of colchicum root were found to contain from 0.32 to 0.38 per cent of colchicine.—Proc. Ohio Pharm. Assoc. 1914, p. 49.

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U. S. P. IX: One gm. of the powdered extract to represent 4 gm. of the drug. Fixed oils to be removed by purified petroleum benzin and dried starch to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 534, and Abstr. Prop. Changes, Part 3, 1914, p. 11.

COLCHICI SEMEN.

U. S. P. IX: The seeds should be dried; ovoid or irregular globular, several seeds cohering. Ash not exceeding 8 per cent. Modified method of assay.—J. Am. Pharm. Assoc. 1914, v. 3, p. 374, 990–991, and Abstr. Prop. Changes, Part 2, 1914, p. 16; Part 4, p. 7–8.

Hooper, David: Attempts to grow meadow saffron in India have not been successful. The monsoon rainfall on the outer Himalayan ranges is apparently too heavy for the plant to make progress.—Montreal Pharm. J. 1914, v. 25, p. 4.

Caesar & Loretz: The valuation of colchicum seed, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 104–105.

Vanderkleed, C. E.: Reports six assays of colchicum seed, found to vary from 0.52 to 1 per cent of colchicine.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Linke, H.: The pharmacopœia should include a limitation for ash and a requirement for extract content.—Apoth.-Ztg. 1914, v. 29, p. 663.

Maines, E. L.: Colchicum seed was found to contain from 2.23 to 2.51 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Colchicum seeds contained from 2.4 to 3.1 per cent of ash and from 26.2 to 35.8 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

Neal, P. C.: Of six samples of colchicum examined, two were accepted and four were rejected.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

COLCHICINA.

E'we, G. E.: One sample of colchicine examined was found to lose 28.4 per cent of its weight at 90°. This loss was due chiefly to chloroform.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 135.

Vanderkleed, C. E.: The new Pharmacopœia will not only provide a specific test to guard against chloroform in colchicine, but will have a general provision that will prevent an article containing more than 5 per cent of foreign volatile matter from being official.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 136.

Souques, A.: Paralysis from colchicine in self-medication. A robust man of 50 took a proprietary remedy corresponding to a total of 34 mg. of colchicine.—(Bull. Acad. Méd. 1914, v. 78, No. 21–22.) J. Am. M. Assoc. 1914, v. 63, p. 202.

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COLLODION.

U. S. P. IX: Directions for making modified by directing that the alcohol be added to the pyroxylin in a suitable bottle and the ether introduced subsequently.—J. Am. Pharm. Assoc. 1914, v. 3, p. 549, and Abstr. Prop. Changes, Part 3, 1914, p. 26.

Chandelon, Th.: A proposed method of making nitrocellulose for collodion.—Bull. Soc. Chim. Belg. 1914, v. 28, p. 13–23.

Knecht and Lipschitz: The action of strong nitric acid on cotton cellulose.—J. Soc. Chem. Ind. 1914, v. 33, p. 116–122.

Chandelon, Th.: On the viscosity of collodions.—Bull. Soc. Chim. Belg. 1914, v. 28, p. 24–32.

Curry, Gordon L.: The four official colodiums are all readily prepared in a retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 57.

COLLODIUM FLEXILE.

U. S. P. IX: Modified formula. Canada turpentine replaced by camphor.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1567, and Abstr. Prop. Changes, 1914, Part 3, p. 5.

COLOCYNTHIS.

U. S. P. IX: The dried pulp of the fruit with not more than 5 per cent of seeds nor more than 2 per cent of epicarp.—J. Am. Pharm. Assoc. 1914, v. 3, p. 374, and Abstr. Prop. Changes, Part 2, 1914, p. 16.

Anon.: An illustrated description of colocynth.—Southern Pharm. J. 1914, v. 7, p. 173.

Roberts, J. C.: A particularly bad lot of colocynth was received during the past year. It was weevil eaten and was composed largely of dark discolored pieces.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 136.

Rippetoe, J. R.: Three samples of colocynth pulp were found to contain from 12.95 to 14.15 per cent ash and from 0.59 to 1.21 per cent of petroleum ether.—Am. J. Pharm. 1914, v. 86, p. 438.

Mann, E. W.: Practically all samples of colocynth pulp examined were in accordance with the characters and tests now official. The ash content varied from 9.7 to 14.9 per cent; petroleum spirit extract from traces to 2.3 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 11.

J. D. Riedel, A.-G.: Colocynthis contained from 5.4 to 8.5 per cent of ash and from 31.2 to 36.1 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

U. S. P. IX: For compound extract of colocynth to direct the use of Curacao aloes, with a slight reduction in the amount of cardamom

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seed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 535, and Abstr. Prop. Changes, Part 3, 1914, p. 12.

Bettencourt, M. F.: The use of colocynth in simple intestinal colic. Colocynth does not gripe when given according to the dictates of specific medication. Colocynth is applicable to the colocynth case and to no other.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 332.

CONDURANGO.

U. S. P. IX: The dried bark of *Marsdenia condurango*. Description includes qualitative test. Ash not exceeding 12 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 374, and Abstr. Prop. Changes, Part 2, 1914, p. 16.

Linke, H.: Six samples of condurango yielded from 13.98 to 20.30 per cent of extractive and from 8.84 to 13.60 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 530.

Rippetoe, J. R.: Two samples of condurango were found to contain 12.90 and 19.86 per cent of alcohol (49 per cent) extract and 11.23 and 8.10 per cent of ash, respectively.—Am. J. Pharm. 1914, v. 86, p. 438.

J. D. Riedel, A.-G.: Condurango contained from 9.5 to 13.1 per cent of ash, and from 15.4 to 22.4 per cent of extract soluble in 1 part alcohol and 3 parts water.—Riedel's Berichte, 1914, p. 31.

Carlson, van de Erve, Lewis and Orr: The action of the so-called stomachics or bitters on the hunger mechanism. In therapeutic quantities the bitters, including condurango, have no effect on the gastric tonus and the gastric hunger contractions or on the parallel sensation of hunger.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 209–218.

CONIUM.

Henkel, Alice: An illustrated description of *Conium maculatum*, L.—Phys. Drug News, 1914, v. 9, p. 157; also Spatula, 1914, v. 20, p. 471.

Vanderkleed, C. E.: Reports one essay of conium, found to contain 0.65 per cent of coniine; above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Marden and Elliott: Trials to find the distribution ratio of coniine did not meet with much success, due to the failure to obtain results which checked well. Coniine alkaloid is so volatile that when 0.14 g. of this substance was exposed to the laboratory draft at the ordinary temperature it lost 93 per cent of its weight in one hour.—J. Ind. & Eng. Chem. 1914, v. 6, p. 931.

Alderman, Theodore Davis: Conium maculatum in nervous and mental diseases. It has replaced the use of narcotics in many cases of insanity.—Eclectic M. J. 1914, v. 74, p. 174–177.

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CONVALLARIA.

U. S. P. IX: Description of rhizome elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 375, and Abstr. Prop. Changes, Part 2, 1914, p. 17.

Lilly, J. K.: Difficulty has been experienced in obtaining prime well-cured roots of convallaria. Physiological assays have also indicated the general poor quality of this drug.—Proc. N. W. D. A. 1914, p. 263; also Oil, Paint & Drug. Rep. 1914, v. 86, September 30, p. 34.

Hamilton, H. C.: The menstruum for fluid extract of convallaria, U. S. P. VIII, is not entirely satisfactory. There are certain advantages to be gained by using a stronger alcoholic menstruum than that prescribed.—Am. J. Pharm. 1914, v. 86, p. 56–61.

Ramsay, C. F.: With the U. S. P. menstruum for fluid extract of convallaria only 50 per cent of the activity was at times obtained.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1647.

Holste, Arnold: The valuation of heart tonics; digitalis, strophanthus, strophanthin, cymarin.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 385–408.

COPAIBA.

J. D. Riedel, A.-G.: The new varieties of copaiba from Manoas in Brazil. A comparison of the physical constants with those of true copaiba.—Pharm. Zentralh. 1914, v. 55, p. 350; also Riedel's Berichte. 1914, p. 27–29.

Gehe & Co.: The production of balsam of copaiba in Brazil has been materially increased due largely to the decrease in the value of rubber produced.—Handelsbericht, 1914, p. 49; also Südd. Apoth.-Ztg. 1914, v. 54, p. 239.

Deussen, Ernst: The examination of official copaiba. A criticism of the Ph. Germ. methods and requirements.—Arch. Pharm. 1914, v. 252, p. 590–600.

Rupp, E.: Outline of method for the determination of the saponification number of balsam of copaiba.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 302.

Herzog, J.: In the testing of copaiba, it is desirable to determine the optical rotation of the volatile oil.—Apoth.-Ztg. 1914, v. 29, p. 310.

Glickman, L. H.: The U. S. P. requirement that copaiba be completely soluble in petroleum benzin can probably not be met.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 136.

Caesar & Loretz: The methods of testing balsam of copaiba and the requirements of the several pharmacopœias.—Jahres-Ber. 1914, p. 51.

Roberts, J. G.: One lot of copaiba examined was of U. S. P. quality with the exception that it contained only 42 per cent of resin instead

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of not less than 50 per cent as required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 136.

E'we, G. E.: A sample of Para copaiba assayed 27.6 per cent resin, required 1.3 cc. of seminormal potassium hydroxide solution in the acid resin test, had a specific gravity of 0.930, gave a large quantity of oily drops in the U. S. P. test for paraffin oils, but answered all other U. S. P. requirements.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 136.

Hankey, William T.: Of 10 samples of copaiba examined, 3 were rejected. One of the rejected samples contained rosin and 1 paraffin.—Proc. Ohio Pharm. Assoc. 1914, p. 48.

Jensen, H. R.: Of 29 samples of copaiba examined, 11 were found to be unsatisfactory.—Evans' An. Notes, 1914, p. 28.

Mann, E. W.: The 1914 Ph. Brit. gives an approximate figure of 55 per cent for resin, with a minimum acid value of 75.6. The 15 samples examined show that while in nearly every instance the acid value is above this minimum figure, there are many samples which would be excluded on account of the excessive resin content. The specific gravity ranged from 0.974 to 0.998; resin content from 53.9 to 68.4 per cent and the acid value from 74.7 to 89.6.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 13.

J. D. Riedel, A.-G.: Report of examination of seven samples of capsules of copaiba balsam, with table showing the physical and chemical properties of the balsam found. Five of the seven samples were found to contain copaiba adulterated with Gurjun balsam or with resin or both.—Riedel's Berichte, 1914, p. 47.

Caesar & Loretz: Adulteration of copaiba with Gurjun balsam and colophony is still met with. The optical rotation of the volatile oil is a satisfactory test.—Jahres-Ber. 1914, p. 6–9.

A book review calls attention to a volume by Ernst Dussen on copaiba balsams and their adulteration.—Pharm. Ztg. 1914, v. 59, p. 343.

J. D. Riedel, A.-G.: A review of some of the recent literature relating to the production of exanthema by inferior qualities of copaiba.—Riedel's Berichte, 1914, p. 60.

CORIANDRUM.

U. S. P. IX: The fruit should contain not more than 5 per cent of other fruits, seeds, and other foreign matter. Description elaborated. Ash not exceeding 7.5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 376, and Abstr. Prop. Changes, Part 2, 1914, p. 18.

Alsberg, C. L.: Coriander should contain not less than 95 per cent of sound coriander seed and not more than 7 per cent of ash.—S. R. A.-Chem. 1914, p. 529; also Oil, Paint & Drug Rep. 1914, v. 85, July 27, p. 11.

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Mann, E. W.: Six samples of the ground fruit of coriander yielded from 3.99 to 6.53 per cent of ash. One of these assayed for ether (0.720) extract, yielded 26.9 per cent (dried over H_2SO_4).—Ann. Rep. Southall Bros. & Barclay, 1914, p. 13.

Schimmel & Co.: The consumption of coriander, formerly so important, has fallen off greatly and the market generally is described as flat.—Schimmel & Co. Semi-Ann. Rep. April, 1914, p. 49–50.

CREOSOTUM.

Klason, Peter: An attempt at a theory of the dry distillation of wood.—J. Prakt. Chem. 1914, v. 90, p. 413–447.

E'we and Vanderkleed: Delicacy of the U. S. P. glycerin test for phenols in creosote.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 277.

Fernau, Albert: For the production of a crystalline mass from creosote, 2 cc. of an alcoholic potassium hydroxide, 1+4, will not suffice. Ten cc. of the solution should be used.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Noyes, C. R.: Coal tar creosote, used as a substitute for beechwood creosote, is a solution of phenol in water of any strength that the maker happens to decide upon.—Proc. Minnesota Pharm. Assoc. 1914, p. 193; also J. Am. Pharm. Assoc. 1914, v. 3, p. 856.

Jensen, H. R.: The 17 samples of beechwood creosote examined during the year have all been pure and of satisfactory strength; specific gravity, 1.077 to 1.081; refractive index, 1.5352 to 1.5412.—Evans' An. Notes, 1914, p. 30.

E'we, G. E.: Three samples of creosote examined were strictly U. S. P. in all particulars.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 136.

Cline, R. R. D.: Samples of creosote were found containing 80, 60, 40, and 30 per cent of guaiacol and one containing 20 per cent of guaiacol.—Proc. Texas Pharm. Assoc. 1914, p. 19.

U. S. P. IX: For creosote water to direct the use of recently boiled distilled water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, Part 3, 1914, p. 2.

Chase, Carroll: Creosote carbonate has a reputation for its supposed direct action in the pneumonic process.—Merck's Arch. 1914, v. 16, p. 69.

CRESOL.

U. S. P. IX: Modified formula. Specific gravity to read from 1.030 to 1.038 at 25°. Test for identity added and the test for hydrocarbons modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1567–1568, and Abstr. Prop. Changes, Part 6, 1914, p. 5–6.

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Rupp, E.: Precautions to be observed in testing cresol by the official modification of the Raschig method.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 314.

Redman, Weith and Brock: A rapid volumetric method for determining *o*, *m*, and *p*-cresols, thymol, and phenol.—Chem. News, 1914, v. 110, p. 168–169, 176, 179.

German patent 268,780, December 24, 1911, covers process for separating *m* and *p*-cresols.—J. Soc. Chem. Ind. 1914, v. 33, p. 246. See also: p. 413.

Lefeldt, M.: The Ph. Germ. V test for the presence of naphthalene in cresol is unnecessarily stringent.—Pharm. Ztg. 1914, v. 59, p. 42.

Scoville, W. L.: Cresol varies considerably in color solubility, and in antiseptic value. Much of the commercial supply is below the U. S. P. standard.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1286.

E'we, G. E.: None of the nine samples of cresol examined had specific gravity between the U. S. P. limits of 1.036 and 1.038.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 137.

Patch, E. L.: In seven samples of cresol the specific gravity varied from 1.028 to 1.038.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287. See also Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Church and Weiss: Paraffin bodies in coal tar creosote and their bearing on specifications.—J. Ind. & Eng. Chem. 1914, v. 6, p. 396–398.

Raiford, L. Chas.: The action of halogen on ₄-Nitro-*m*-cresol.—J. Am. Chem. Soc. 1914, v. 36, p. 670–680. See also Raiford and Leavell, p. 1498–1511.

Herzog and Kleinmichel: The examination of liquor cresolis saponatus according to the Ph. Germ. V. and the quantitative determination of cresol.—Apoth.-Ztg. 1914, v. 29, p. 402–403.

Goerlich, R.: The valuation of the Ph. Germ. V solution of cresol.—Pharm. Ztg. 1914, v. 59, p. 580–582.

Rost, E.: The action of disinfectants containing cresol, and of petroleum on animals.—Arb. k. Gsndsamte, 1914, v. 47, p. 240–251.

Graves and Kober: Tricresol as a substitute for toluene in enzyme work.—J. Am. Chem. Soc. 1914, v. 36, p. 742–758.

Gortner and Banta: Amphibian eggs and embryos are killed by a 0.05 per cent solution of trikresol within 72 hours.—Biochem. Bull. 1914, v. 3, p. 367.

Fitzpatrick, Atkinson and Zingher: The comparative importance of pressure and of toxicity of trikresol in subdural injections of sera.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 182–183. See also Auer, John: J. Am. M. Assoc. 1914, v. 62, p. 1799.

Collins and Hall: The use of coal tar creosote and naphthalene for preserving wooden fences.—J. Soc. Chem. Ind. 1914, v. 33, p. 466–468.

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CRETA PREPARATA.

E'we, G. E.: Two samples of prepared chalk contained 1.15 per cent and 1.20 per cent, respectively, of matter insoluble in acids. They were otherwise U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

CROCUS.

Geare, R. I.: The saffron of commerce. Outline description of the methods employed in preparing it for market.—Am. Druggist, 1914, v. 62, p. 12. See also Blaque, G.: Bull. sc. pharmacol. 1914, v. 21, p. 176–179.

Augustin, Béla: The cultivation of saffron in Hungary; a review.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 287–288.

Fromme, G.: Observations on the valuation of crocus. The determination of the insoluble constituents and the determination of adulterants.—Apoth.-Ztg. 1914, v. 29, p. 737–739. See also Cæsar & Loretz: Jahres-Ber. 1914, p. 63–67, and p. 12–23.

Nestler, A.: A new method for the examination of saffron. Illustrated description of microcrystals.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 264–268.

Dichgans, H.: A simple method for the detection of magnesium sulphate in saffron by taking advantage of the fact that hydrated chloral induces crystallization of magnesium sulphate, in a mixture of water and glycerin.—Apoth.-Ztg. 1914, v. 29, p. 407. See also Nestler, A.: Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 388–391, and Arch. Chem. u. Micros. 1914, v. 7, p. 67–72.

Verda, A.: Observations on the use of phosphomolybdic acid as a reagent in the chemical and microchemical detection of adulteration of saffron.—Chem.-Ztg. 1914, v. 38, p. 325–327; also Schweiz. Apoth.-Ztg. 1914, v. 52, p. 350–353, 365–369.

Decker, Fritz: Contribution to our knowledge of crocetin, the coloring matter of saffron.—Arch. Pharm. 1914, v. 252, p. 139–160.

Križižan, R.: Contribution on the examination of saffron; the determination of invert sugar.—Ztschr. öffentl. Chem. 1914, v. 20, p. 109–114, 121–124.

Gehe & Co.: The examination of several authentic samples of saffron showed the presence of boric acid as a natural constituent.—Pharm. Zentralh. 1914, v. 55, p. 398.

Lilly, J. K.: Several samples of Spanish saffron consisted of the stamens of crocus sativus instead of the stigmas.—Proc. N. W. D. A. 1914, p. 264; also Oil, Paint & Drug. Rep. 1914, v. 86, September 30, p. 35.

Editorial: The detection of adulteration in saffron. Pure saffron was found to contain from 4.2 to 6.3 per cent of ash of the dry saffron, while the adulterated article was found to contain from 8.4 to 34.8

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per cent of ash on the dry product.—Brit. & Col. Drug. 1914, v. 65, p. 146.

Maines, E. L.: Saffron was found to contain from 4.52 to 6.98 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Mann, E. W.: In 1 sample only, out of 17 samples of saffron tested, was any excess of mineral matter present; in this 1 the figure was 8.14 per cent. All others were included between 3.30 and 6.92 per cent (calculated on the dry saffron).—Ann. Rep. Southall Bros. & Barclay, 1914, p. 22.

Jensen, H. R.: Twenty-two samples of saffron were examined, most of which were of average quality. One sample contained a marked amount of pollen, and four showed variations of color intensification. One sample was heavily adulterated and dyed.—Evans' An. Notes, 1914, p. 58.

J. D. Riedel, A.-G.: Saffron contained from 4.7 to 5.8 per cent of ash, and from 61.7 to 66.4 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

CUBEBA.

U. S. P. IX: The dried, full-grown, unripe fruit with not more than 5 per cent of stems and other foreign matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 376, and Abstr. Prop. Changes, Part 2, 1914, p. 18.

Gehe & Co.: Table showing the amount of cubebs available during the years 1903 to 1912, inclusive.—Handelsbericht, 1914, p. 71.

Alsberg, C. L.: Analyses have been made of a large number of samples of cubeb berries to set standards for the composition of the pure article and to detect the admixture of inferior or exhausted berries.—Am. Food J. 1914, v. 9, p. 21.

Caesar & Loretz: The valuation of cubebs and the determination of the nature of the ether extract.—Jahres-Ber. 1914, p. 68–69.

Rippetoe, J. R.: Six samples of cubeb were found to contain from 8.87 to 11.04 per cent of alcohol extract and from 4 to 6.28 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 438.

Maines, E. L.: Cubeb berries were found to contain from 6.03 to 7.87 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Scoville, W. L.: Cubeb ran quite uniform during the past year, yielding 18.1 per cent to 22 per cent oleoresin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

J. D. Riedel, A.-G.: Cubebs contained from 5 to 8.5 per cent of ash and from 11.1 to 14.7 per cent of extract soluble in 1 part ether and 1 part alcohol.—Riedel's Berichte, 1914, p. 31.

Maines and Gardner: In the manufacture of extract of cubebs the oil of cubebs can be obtained as a by-product by simply redistilling the exhausted drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1327; also Merck's Rep. 1914, v. 23, p. 275.

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Vanderkleed, C. E.: Reports six assays of cubebs, found to vary from 13.9 to 19.8 per cent of oleoresin; five above and one below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

E'we, G. E.: One lot of oleoresin of cubebs contained the waxy deposit which the U. S. P. directs should be rejected.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 152.

CUPRI SULPHAS.

Fonzes, Ciacon: The basic sulphates of copper.—J. Soc. chim. France, 1914, v. 15, p. 723–727.

Cundall and Fairgrieve: The action of sulphuric acid on copper.—J. Chem. Soc. Lond. 1914, v. 105, p. 60–63.

Mann, E. W.: Somewhat excessive proportions of iron have characterized three of the samples of the commercial variety of copper sulphate examined during the year.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 45.

Hill, C. A.: Of 50 samples of copper sulphate examined during the years 1910 to 1913, inclusive, the iron was found to vary from 0 to 0.2 per cent. The percentage of samples conforming with the official requirements varied from 75 per cent in 1912 to 100 per cent in 1911.—Chem. & Drug. 1914, v. 85, p. 18.

Anon.: The quickest emetic one can administer to child or adult is not apomorphine, but copper sulphate, one or two grains dissolved in a teaspoonful or two of water. It usually acts instantly.—Critic and Guide, 1914, v. 17, p. 28.

DECOCTA.

U. S. P. IX: Decoctions shall be freshly prepared from the drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Curry, Gordon L.: The official decoctions for which a type formula only is given should be extemporaneously prepared in the retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 57.

Jørgensen, Chr. F.: Decoctions and infusions; a comparative study of the results obtained by the methods employed in the Danish and German Pharmacopœias.—Arch. Pharm. og Chem. Copenhagen, 1914, v. 21, p. 225–232.

DEXTRIN.

Jensen, H. R.: White dextrin is obtained by hydrolysis at temperatures much lower than that used for the yellow; it is a variable product and always contains a quantity of unaltered starch.—Evans' An. Notes, 1914, p. 30.

Lewis, W. K.: The solubility of dextrin. Dextrin is a complex body, the components of which vary in solubility, and it is easily pos-

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sible that the behavior on treatment with increasing amounts of water is due to the solution of increasingly insoluble components.—J. Ind. & Eng. Chem. 1914, v. 6, p. 308–309.

Pringsheim and Eissler: Further contribution on the chemistry of starch, with report on experimental work on dextrins and related compounds.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2565–2572.

DIACETYL-MORPHINE HYDROCHLORIDE.

Editorial: Heroin hydrochloride in the Ph. Brit. V becomes diamorphinæ hydrochloridum.—Am. Druggist, 1914, v. 62, p. 404. See also Chem. & Drug. 1914, v. 85, p. 487.

News Note: The judge, in a court decision in Jersey City, held that for legal purposes heroin is identical with morphine.—Pract. Drug. 1914, v. 32, p. 214. See also Pharm. Era, 1914, v. 47, p. 234, and Am. Druggist, 1914, v. 62, p. 121.

Kollo, Konstantin: Ampoules of diacetyl morphine hydrochloride should be prepared in sterile apparatus and may be filtered.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Brown, L. A.: Three samples of heroin hydrochloride tablets analyzed; two passed and one adulterated. Samples ran in strength from 100.7 to 73.6 per cent of the declared strength.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Osterlund, O. W.: It appears that cocaine fiends get practically the same results from heroin as from cocaine. They crush the tablet and snuff it.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 218. See also Foust, James: Bull. Pennsylvania D. & F. Div. 1914, v. 12, Nos. 11 and 12, p. 15, and Editorial: Bull. Pharm. 1914, v. 28, p. 3.

Editorial: The Philadelphia coroner has had five deaths within a year from heroin.—Ellingwood's Therap. 1914, v. 8, p. 30.

DIASTASE.

Thatcher and Koch: The quantitative extraction of diastases from plant tissues.—J. Am. Chem. Soc. 1914, v. 36, p. 759–770.

Bartholomew, E. T.: Concerning the presence of diastase in certain red algæ.—Bot. Gaz. 1914, v. 57, p. 136–147.

Baker and Hulton: The action of diastase on starch granules. Part 1. A preliminary report.—J. Chem. Soc. Lond. 1914, v. 105, p. 1529–1536; also Proc. Chem. Soc. 1914, v. 30, p. 133–134.

Mounier, A.: The determination of the diastasic power of extract of malt.—Ann. chim. analyt. 1914, v. 19, p. 51–54.

Baker, W. L.: Comparison and criticism of two methods of determining the starch converting power of diastase.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 205–207.

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Glickman, L. H.: The four samples of diastase examined assayed 1,250 in starch converting power in two hours.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 137.

DIGITALIS.

U. S. P. IX: Digitalis should not contain more than 2 per cent of stems, flowers, and other foreign matter. Description somewhat elaborated. Ash not exceeding 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 377, and Abstr. Prop. Changes, Part 2, 1914, p. 19.

Anon.: General description of digitalis, its structure and characteristics, with some reference to its cultivation, and the uses and therapeutic effects of the drug; with illustrations.—Southern Pharm. J. 1914, v. 6, p. 210–212, 259–262, 308–309. See also Kremers, Edward: Bull. Wisconsin Univ. 1914, No. 738, p. 9.

Lloyd, John Uri: Characteristics and constituents of digitalis.—Eclectic M. J. 1914, v. 74, p. 229.

Miller, Fred A.: More or less uncertainty exists as to the exact botanical source of digitalis. A report of propagation experiments.—Bull. Torrey Bot. Club, 1914, v. 41, p. 115–118.

Miller and Baker: Comparative activity of various species and varieties of digitalis.—J. Am. Pharm. Assoc. 1914, v. 3, p. 304–306; also Miller and Baker: Lilly Sci. Bull. 1914, Ser. 1, p. 202–205.

Hamner, J. W.: A comparison of wild-growing and of cultivated digitalis.—Svensk farm. Tidskr. 1914, v. 18, p. 588–592.

Hooper, David: Foxglove grows in the Himalayan and other temperate regions of India. It is quite acclimatized on the Nilgiris, and grows without any attention.—Montreal Pharm. J. 1914, v. 25, p. 4.

Newcomb, Edwin L.: Report of experiments in the cultivation of digitalis and the comparative activity of the American-grown drug.—Proc. Minnesota Pharm. Assoc. 1914, p. 152–158. See also Wulling: Am. Druggist, 1914, v. 62, p. 339.

Mitten and Backer: A study of the physiological activities of the first-year leaves of digitalis.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 397–398.

Freund, Hans: The gravimetric determination of the manganese content of digitalis leaves, with a table showing the results obtained in connection with 10 samples.—Pharm. Zentralh. 1914, v. 55, p. 481–485.

Burmann, James: Influence of atmospheric conditions on the evolution of the active principles of digitalis, with a chart showing the relation of temperature and moisture to the glucosidal content of the drug.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 527–530.

Maines, E. L.: Digitalis leaves were found to contain from 6.90 to 11.90 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

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J. D. Riedel, A.-G.: Digitalis contained from 7.4 to 10.6 per cent of ash, from 26.4 to 37.6 per cent of extract soluble in water, and from 38.9 to 44.4 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Helch, Hans: As the physiological standardization of digitalis is as yet not available, the Keller-Kiliani reaction included in the Ph. Germ V should be also included in the new edition of the Austrian Pharmacopœia.—Pharm. Post, 1914, v. 47, p. 580.

Vanderkleed, C. E.: Reports one assay of digitalis, found to contain 0.356 per cent of digitoxin; above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Hatcher, R. A.: Digitalis and its preparations; a review of the collection and preservation of digitalis; its chemistry and pharmaceutical preparations.—Drug. Circ. 1914, v. 58, p. 517–519, 607–610. See also review: Am. J. Pharm. 1914, v. 86, p. 517–520, 567–568.

Osseward, Cornelius: When digitalis leaves are to be used all stems should be removed. Digitalis should be freshly powdered whenever called for.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1555.

Vienna Correspondent: Report of a dangerous admixture of hyoscyamus with digitalis.—Lancet, 1914, v. 187, p. 414.

U. S. P. IX: To require that infusion of digitalis be freshly prepared.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Herzog, Oscar: A study of gelatinous infusions of digitalis to avoid which absolute cleanliness must be observed.—Pharm. Post, 1914, v. 47, p. 524–525.

Wilbert, M. I.: Greater uniformity in the activity of preparations of the heart-tonic group of drugs may be secured by using 70 per cent alcohol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1662.

Hamilton, H. C.: Anyone who has tried the U. S. P. VIII menstrua for digitalis has found it unsatisfactory from a pharmaceutical point of view, to say nothing of the loss in potency of the preparation.—Am. J. Pharm. 1914, v. 86, p. 56–61.

Ramsay, C. F.: Using the menstruum directed by the U. S. P. for fluid extract of digitalis it is impossible to get the full activity of the drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1647.

U. S. P. IX: Menstruum for tincture of digitalis changed from diluted alcohol to alcohol 3 volumes and water 1 volume.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1577, and Abstr. Prop. Changes, Part 6, 1914, p. 15.

Freund, Hans: The composition of the tincture of digitalis and methods for testing the preparation.—Pharm. Zentralh. 1914, v. 55, p. 266–268.

Guyer, R. Glade: Comparative tests of tinctures made from the lamina and from the petioles, midribs, and veins of digitalis leaves.

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The preparations, although they differed somewhat in specific gravity, did not differ markedly in their effect.—Pharm. J. 1914, v. 92, p. 165. For discussion see p. 187; also Chem. & Drug. 1914, v. 84. p. 240–241.

Ziefle, Adolph: Of 49 samples of digitalis leaves examined 10 were poor or unfit for use.—Rep. North Dakota Agric. Exper. Sta. 1912, p. 137–138.

Symes, W. Legge: The activity and stability of tincture of digitalis B. P.—Brit. M. J. 1914, v. 1, p. 1343–1347; also Pharm. J. 1914, v. 92, p. 192–193.

Goodall, Alexander: On the effect of gastric and pancreatic ferments on the potency of tincture of digitalis.—Lancet, 1914, v. 186, p. 1678–1680.

Martindale, W. H.: Deterioration of digitalis preparations.—Brit. M. J. 1914, v. 2, p. 47.

Cline, R. R. D.: Samples of digitalis preparations were found one-fifth, one-sixth, one-seventh, one-tenth, and one one-twentieth of the strength they should be.—Proc. Texas Pharm. Assoc. 1914, p. 19.

Arends, Georg: The pharmacopœia should offer efficient substitutes for some of the many proprietary preparations of digitalis.—Apoth.-Ztg. 1914, v. 29, p. 987.

Stephenson, Thomas: Digitalic acid and its probable use in therapy.—Pharm. J. 1914, v. 92, p. 165. For discussion see p. 187; also Chem. & Drug. 1914, v. 84, p. 241.

Smith, F. A. Upshur: There is no drug that offers better proof of the necessity of standardizing vegetable drugs and their preparations than digitalis.—Northwestern Druggist, 1914, v. 15, May, p. 22.

Haskell and Miller: Influence of heat and method of storing upon the potency of digitalis leaves. In one year no deterioration occurred in samples of leaf, irrespective of the manner of storage, even when the moisture content was as great as 6.04 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 306–308; also Lilly Sci. Bull. 1914, Ser. 1, p. 206–208.

Haskell, Chas. C.: The influence of temperature on the results secured by Houghton's method of assay for the heart tonics.—Lilly Sci. Bull. 1914, Ser. 1, p. 199–201.

Ruitinga, P.: Physiological and chemical testing of the activity of digitalis leaf.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 553–558.

Hamner, J. W.: The Focke method for the valuation of digitalis preparations.—Svensk farm. Tidskr. 1914, v. 18, p. 81–87. See also p. 113–116, 137–138, 153–156, 169–171, 195–198, 220–222, 235–237, and p. 249–254.

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Holste, Arnold: The valuation of heart tonics. Digitalis, strophanthus, strophanthin, cymarin.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 385–408.

Gottlieb, R.: The biologic evaluation of preparations of digitalis by means of the frog. A review.—Münch. med. Wchnschr. 1914, v. 61, p. 813–818.

Kobert, R.: Observations on the biological valuation of digitalis preparations. The valuation of digitalis preparations by means of a hemolytic process and the valuation of digitalis preparations by means of the frog method.—Apoth.-Ztg. 1914, v. 29, p. 761–763.

Lehnert and Loeb: The physiological valuation of a number of preparations of digitalis.—Apoth.-Ztg. 1914, v. 29, p. 204.

Pearson, William A.: The physiological testing of heart tonics.—Hahnemann. Month. 1914, v. 49, p. 106–116; also Am. J. Pharm. 1914, v. 86, p. 61–71.

Ginzberg and Hohlberg: A contribution on the physiological standardization of heart tonics.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 559–613.

Joanin, A.: The physiological titration of cardiac tonics.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 614–640.

Haskell, C. C.: Seasonal variations in the resistance of guinea pigs to poisoning by ouabain and by liquid preparations of digitalis.—Am. J. Pharm. 1914, v. 86, p. 7–11; also Lilly Sci. Bull. 1914, Ser. 1, p. 173–177.

Vanderkleed and Pittenger: Variation in susceptibility of the guinea pig, with report of a number of observations, from which the authors conclude that it is not necessary for them to make any changes in the conclusions arrived at in last year's paper.—J. Am. Pharm. Assoc. 1914, v. 3, p. 815–819.

Haskell, Chas. C.: The rapidity of elimination or destruction of strophanthus and digitalis glucosides by guinea pigs.—Lilly Sci. Bull. 1914, Ser. 1, p. 178–180.

Lehnert and Loeb: The physiologic valuation of proprietary preparations of digitalis. Several of them were far below the strength claimed for them.—Therap. Monatsh. 1914, v. 28, p. 164–170.

Krönig, Ernst: A case of attempted suicide by means of digalen.—Münch. med. Wchnschr. 1914, v. 61, p. 718–719.

Kolipinski, Louis: William Withering and his book on the foxglove.—Med. Rec. 1914, v. 86, p. 8–14.

Monkhtar, Akil: On the action of digitalin.—Bull. gén. therap. 1914, v. 168, p. 136–142.

Macht, D. I: The action of drugs on the isolated pulmonary artery. The effect of digitalin and digitoxin on the pulmonary was a constriction.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 21.

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Powell, Richard Douglas: Clinical remarks on the use of digitalis in heart disease.—Practitioner, 1914, v. 92, p. 612–620.

Bishop, Louis Faugeres: Digitalis in chronic diseases of the heart. With special reference to the advisability of its continuous administration.—New York M. J. 1914, v. 100, p. 399–400.

James and Hart: Auricular fibrillation. Clinical observations on pulse deficit, digitalis, and blood pressure.—Am. J. M. Sc. 1914, v. 147, p. 63–71.

Janeway, Theodore C.: The comparative value of cardiac remedies, including the study of the action of strophanthin, digitalis, caffeine and its allies.—Arch. Int. Med. 1914, v. 13, p. 361–383.

Lawrence, Charles H.: The effect of digitalis on the blood pressure and pulse pressure in the presence of cardiac decompensation.—Boston M. & S. J. 1914, v. 37–41.

Cohn and Fraser: Certain effects of digitalis on the heart. A study of 12 patients with normal auriculo-ventricular rythm.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 512.

Piccinini, Guido, M.: Observations on the production of tetanic convulsions by digitalis, with a further review of the literature from 1910 to 1914.—Arch. farmacol. sper. 1914, v. 18, p. 9–36, 49–64.

Baker, William F.: Some neurological observations with digitalis.—Hahnemann. Month. 1914, v. 49, p. 351–359.

Schulz, Hugo: Report of a further study on the influence of digitalis on the color sensitiveness for green and red.—Arch. ges. Physiol. 1914, v. 156, p. 610–618.

Fearn, John: The eclectic physician has many other remedies that will do all that is claimed for digitalis and do it safer.—Eclectic M. J. 1914, v. 74, p. 67.

For additional comments on digitalis and digitalis bodies see Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.; Index Med.; J. Am. M. Assoc.

ELASTICA.

Geare, R. I.: The cultivation of rubber, with special reference to Central America. An illustrated description of the methods employed.—Merck's Rep. 1914, v. 23, p. 56–58.

Harries, C.: A contribution to our knowledge of the constitution of rubber and related combinations.—Ann. Chem. 1914, v. 406, p. 173–226. See also Caspari, W. A.: J. Chem. Soc. Lond. 1914, v. 105, p. 2139–2150, and Pharm. Zentralh. 1914, v. 55, p. 796–797.

Perrot, Emile: On the uses of the milk of the Hevea and other rubber-producing plants.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 998–999.

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Lloyd, Francis E.: The rubber and resin content of the desert rubber plant "guayule" in relation to rainfall.—J. Soc. Chem. Ind. 1914, v. 33, p. 107–109.

Norlin, Evert: The synthesis of rubber.—Svensk Kem. Tidskr. 1914, v. 26, p. 68–71.

Pond, Francis J.: A review of the pioneer work on the synthesis of rubber.—J. Am. Chem. Soc. 1914, v. 36, p. 165–199.

Steimmig, G.: A contribution to our knowledge of synthetic rubber from isoprene.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 350–354. See also Harries, C.: p. 573–577.

Stevens, Henry P.: The estimation of sulphur in rubber.—Analyst, 1914, v. 39, p. 74–78.

Wesson, L. G.: The combustion method for the direct determination of rubber, with an illustrated description of the apparatus used.—J. Ind. & Eng. Chem. 1914, v. 6, p. 459–462.

Holt, A.: The newer chemistry of rubber; a review.—Ztschr. ang. Chem. 1914, v. 27, p. 153–158; also Pharm. Zentralh. 1914, v. 55, p. 877–881.

Geer, W. C.: A book review of a volume on the chemistry of rubber, by B. D. Porritt.—J. Ind. & Eng. Chem. 1914, v. 6, p. 1047. See also Nature, 1914, v. 92, p. 524.

Lloyd, F. E.: Book review of a volume on rubber and rubber planting by R. H. Lock.—Science, 1914, v. 40, p. 411–413.

Phelps and Stevenson: The chemical composition of rubber used in nursing nipples and in some rubber toys.—Bull. Hyg. Lab. No. 96, p. 55–62.

Kühl, Hugo: The danger of lead poisoning from the use of rubber nipples containing lead compounds.—Pharm. Zentralh. 1914, v. 55, p. 712–713.

For additional references on rubber see Chem. Abstr.; Exper. Sta. Rec.; Chem. Zentralbl.; Pflanzer; J. Agric. Trop.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

ELATERIUM.

Mann, E. W.: Two samples of elaterium have been examined. One, of foreign origin, proved to be of very unsatisfactory quality. The English sample contained 21.7 per cent of elaterin; the foreign sample 11 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 14.

ELIXIR ADJUVANS.

U. S. P. IX: Title changed to Elixir Glycyrrhizæ and the amount of fluid extract of glycyrrhiza changed from 120 cc. to 125 cc. per 1000 cc.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1568, and Abstr. Prop. Changes, Part 6, 1914, p. 6.

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ELIXIR AROMATICUM.

Whorton, C.: A revised formula for aromatic elixir, in which magnesium carbonate, technical, is proposed as a clarifying agent. Outline of a method for making the preparation.—Proc. Alabama Pharm. Assoc. 1914, p. 109. See also Nixon, C. F.: Apothecary, 1914, v. 26, January, p. 20.

Egan, T. H.: Recommends that the mixture of alcohol and spirit of orange be put in a refrigerator for 48 hours to blend.—Am. Druggist, 1914, v. 62, p. 209.

ELIXIR FERRI, QUININÆ ET STRYCHNINÆ PHOSPHATUM.

Allen, R. M.: Considerable confusion exists among druggists as to what should be dispensed for elixir iron, quinine, and strychnine. Three official and a number of unofficial formulas are employed.—Circ. Kentucky Agric. Exper. Sta. 1914, March 1, p. 1.

Rippetoe, J. R.: Elixir iron, quinine, and strychnine phosphates, U. S. P., is a splendid example of the manufacturer's problems and for that matter the retail druggist's also. Every issue of the various drug journals brings forth some new suggestion until it seems everyone must have a different method for making it.—Am. J. Pharm. 1914, v. 86, p. 116.

Hemm, Francis: The pharmacopœial formula for elixir of the phosphates of iron, quinine, and strychnine is generally unsatisfactory. It is not only a cumbersome process, but the preparation itself readily changes and gets red.—Proc. Missouri Pharm. Assoc. 1914, p. 14. See also Williams, Ed. E.: Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Spero, A. P.: A formula for elixir of iron, quinine, and strychnine in which potassium citrate is directed to facilitate solution.—Bull. Pharm. 1914, v. 28, p. 339. See also Llewellyn, H. D.: Proc. Missouri Pharm. Assoc. 1914, p. 142.

Brown, L. A.: Fourteen samples of elixir of iron, quinine, and strychnine analyzed; 6 passed and 8 adulterated or misbranded.—Proc. Kentucky Pharm. Assoc. 1914, p. 118.

Congdon, Leon A.: Two samples of elixir of the phosphates of iron, quinine, and strychnine (U. S. P.); both not standard.—Rep. Kansas Bd. Health, 1914, p. 100.

Todd, A. R.: Of four samples of elixir of iron, quinine, and strychnine phosphate examined, two were found to be adulterated.—Rep. Michigan D. & F. Com. 1914, p. 176.

Todd, A. R.: Of five samples of elixir of iron, quinine, and strychnine phosphate examined, two were found to be adulterated or illegal.—Bull. Michigan D. & F. Dept. 1914, May-June, p. 27, November-December, p. 22.

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Carlson, van de Erve, Lewis and Orr: The action of the so-called stomachics or bitters on the hunger mechanism. In therapeutic quantities the bitters, including elixir of iron, quinine, and strychnine phosphate, have no effect on the gastric tonus and the gastric hunger contractions or on the parallel sensation of hunger.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 209–218.

ELIXIRIA, N. F.

Rippetoe, J. R.: Elixirs, or similar preparations, are very popular as a means for administering most any drug, whether it has merits or not. They are often very troublesome to make.—Am. J. Pharm. 1914, v. 86, p. 116.

Anon.: No one can make a first-class elixir from a volatile oil that has been partly spoiled. Yet deteriorated volatile oils are being used every day for that purpose.—N. A. R. D. Notes, 1914, v. 18, p. 481.

Compound elixir of almond.—Amos, W. S.: A sample of compound elixir of almond made May 15, 1912, has darkened slightly. The odor is that of orange flower water—"heavy" and unpleasant, the taste is at first pleasant but weak—afterwards that of the orange flower water and vanillin combination.—J. Am. Pharm. Assoc. 1914, v. 3, p. 322.

Compound elixir of cardamon.—Amos, W. S.: The proposed compound elixir of cardamon, made May 15, 1912, is cloudy, with precipitate. The taste is not unpleasant, but is too weak.—J. Am. Pharm. Assoc. 1914, v. 3, p. 322.

Elixir digestivum compositum.—Williams, Ed. E.: Elixir digestivum compound is an incongruous mixture, and should be made either an active pepsin compound or an active pancreatin compound. It is not practicable to make it both.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Nixon, C. F.: Modified formula for compound digestive elixir.—Apothecary, 1914, v. 26, January, p. 20.

"Harmat": Elixir of Lactated Pepsin should be included as one of the subtitles under Elixir Digestivum Compositum, N. F.—N. R. A. D. Notes, 1914, v. 18, p. 945.

Snider, H. F.: Elixir Lactated Pepsin is one of the most indefinite preparations on the market. It may be bought at various prices and is labeled, representing 48, 80, 160 grains of Compound Pepsin Powder or Lactated Pepsin to the ounce. The product labeled 80 or 160 grains may be bought just as cheap as that labeled 40 grains.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 193.

Elixir of formates.—Amos, W. S.: There is not sufficient demand for the elixirs of formates to justify their inclusion in the National Formulary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

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Elixir gentianæ.—Reum, Arthur: A modified process for making elixir of gentian, N. F.—Pacific Pharm. 1914, v. 8, p. 41–42.

Elixir gentianæ glycerinatum.—Kaiser, W. F.: A modified formula for N. F. glycerinated elixir of gentian to be made directly from the drugs.—Bull. Pharm. 1914, v. 28, p. 481.

Nixon, C. F.: For glycerinated elixir of gentian the acetic ether and the saccharin should be reduced in quantity.—Apothecary, 1914, v. 26, January, p. 21.

Elixir of glycerophosphates.—Williams, Ed. E.: Elixir glycerophosphates of the N. F. deposits a crystalline precipitate on standing. This can be remedied by substituting 10 cc. of lactic acid for the 8 cc. of phosphoric acid of the formula.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Hague, George W.: Elixir of glycerophosphates when stored in white bottles produces a heavy precipitate on standing, while that stored in amber-colored bottles does not. This elixir should, therefore, be directed to be kept in amber-colored bottles.—Merck's Rep. 1914, v. 23, p. 33. See also Anon.: Am. Druggist, 1914, v. 62, p. 214.

Aqueous elixir of glycyrrhiza.—Amos, W. S.: Aqueous elixir of licorice made May 15, 1912, has kept perfectly. It is suggested that the fluid extract of licorice of the formula be replaced by the fluid glycerate to be in keeping with the title, which suggests no alcohol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 322.

Elixir paraldehydi.—Williams, Ed. E.: Elixir of paraldehyde, N. F., separates into two layers on standing. If the amount of alcohol is increased to 335 cc. a permanent solution results.—Proc. Wisconsin Pharm. Asso. 1914, p. 23.

Elixir pepsini et bismuthi.—Hague, George W.: The N. F. formula for elixir of pepsin and bismuth permits the use of caramel coloring. This is a mistake; official preparations should be colored or not colored, so as to insure their being uniform.—Merck's Rep. 1914, v. 23, p. 33.

Elixir potassii bromidi.—Hague, George W.: The N. F. formula for elixir of potassium bromide permits the addition of tincture of cudbear as a color. This is a mistake; official preparations should be colored or not colored, so as to insure their being uniform.—Merck's Rep. 1914, v. 23, p. 33.

Lythgoe, Hermann C.: Of 20 samples of elixir of potassium bromide examined, 3 were below the National Formulary strength, containing, respectively, 71, 75, and 78 per cent of the required amount of potassium bromide.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 408.

Red elixir.—Amos, W. S.: The proposed red elixir does not contain enough color, and it is suggested that the amount of cudbear be doubled, so that the elixir may be diluted, as in prescription work,

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and the color still be noticeable.—J. Am. Pharm. Assoc. 1914, v. 3, p. 322.

Compound elixir of sodium salicylate.—Amos, W. S.: Compound elixir of sodium salicylate precipitates and the taste is objectionable. It should not be included in the new formulary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 322.

Anon.: The elixir of sodium salicylate, N. F., is liable to become discolored with age and should always be freshly prepared when wanted.—N. A. R. D. Notes, 1914, v. 18, p. 211.

Elixir terpini hydratis.—Norwood, T. W.: The addition of sirup to elixir of terpene hydrate is unnecessary and the use of compound spirit of orange as a flavoring is recommended.—Drug. Circ. 1914, v. 58, p. 390.

Williams, Ed. E.: The official elixir terpin hydrate contains too much sirup and the sugar is thrown out of solution by the alcohol in the formula.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Compound elixir of vanillin.—Amos, W. S.: The proposed compound elixir of vanillin has darkened to a caramel brown. The taste is not pleasant. This is considered the poorest elixir of any proposed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 322.

EMPLASTRA.

Curry, Gordon L.: All of the seven official plasters should be made by the retail druggist.—Proc. Kentucky Pharm. Assoc. 1914, p. 57.

Editorial: All self-respecting registered chemists should refuse to sell diachylon to anyone. Its legitimate use as a plaster is so trifling nowadays that the public would suffer little inconvenience if they could not buy it from pharmacists.—Chem. & Drug. 1914, v. 84, p. 458. See also Chem. & Drug. Australas. 1914, v. 29, p. 204.

EMULSA.

U. S. P. IX: Slight change in the directions for making emulsion of cod liver oil.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Anon.: Emulsions and methods of making them.—Pharm. J. 1914, v. 93, p. 23–25.

LaWall and Forman: The analysis of emulsions.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1444–1445. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 364.

Löffl: For the exact determination of fats in emulsions, only the Soxhlet extraction method gives uniformly reliable results. All other methods are uncertain.—Südd. Apoth.-Ztg. 1914, v. 54, p. 398.

Curry, Gordon L.: All of the six official emulsions can be practically prepared in the retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 57.

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Anon.: Adrenalin, or lavo-methylamino-ethanol-catechol, a new addition to the Ph. Brit. May be obtained, it is stated, from the suprarenal glands of animals.—Chem. & Drug. 1914, v. 85, p. 487.

Elliott, T. R.: The adrenal glands; a review.—Brit. M. J. 1914, v. 1, p. 1393–1397.

Seidell and Fenger: Variation in the epinephrine content of suprarenal glands.—Bull. Hyg. Lab. No. 100, p. 55–66.

Beckwith, C. P.: The pharmacy of adrenalin. A review of the chemistry of the substance, with some remarks on the incompatability.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1547–1554.

Rowe, L. W.: The sterilization of adrenalin solutions. Adrenalin chloride solution in ampoules can be heated continuously for three hours to the temperature of boiling water without any loss of activity.—Am. J. Pharm. 1914, v. 86, p. 145–149.

Anon.: The sterilization of ampoules of morphine and suprarenin solutions by means of heat.—Pharm. Post. 1914, v. 47, p. 93.

Frey, Ernst: An experimental study to determine the destruction of adrenalin by iodine in the organism.—Arch. exper. Path. u. Pharmakol. 1914, v. 76, p. 65–80.

Pilcher, J. D.: The submucosa of the nasal passage forms an excellent absorbing surface, at least for epinephrine, and probably, therefore, for other drugs.—J. Am. M. Assoc. 1914, v. 63, p. 208–209.

Sugimoto, T.: The action of adrenalin on the isolated uterus of the guinea pig. Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 29.

Will and Crawford: Note on the action of epinephrine on the guinea pig uterus.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 126–127.

Gunn and Gunn: The action of certain drugs on the uterus of the guinea pig and of the rat.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 527–538.

Macht, D. I.: The action of drugs on the isolated pulmonary artery. Epinephrine is practically the only drug whose action has been studied by previous investigators.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 16.

Falta, W.: Observations on the influence of adrenalin on alantoin elimination in the dog.—Ztchr. exper. Path. u. Therap. 1914, v. 15, p. 356–358.

Niculescu, Petre: The relation of the physiological actions of hypophysis extract, adrenin, ergot preparations, and imidazolyl-ethylamine.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 1–11. See also Borruttau, H., p. 11–12.

Moog, O.: On the mutual synergism of normal serum and of adrenalin in the frog.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 346–360.

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van Leersum and Rassers: Contribution to our knowledge of experimental adrenalin atheroma.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 230–236.

Lusk, Graham: The influence of epinephrine on carbohydrate metabolism.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 49–50.

Boise, Eugene: The heart in shock, and the action of epinephrine on the heart.—New York M. J. 1914, v. 99, p. 983–987.

Miller, W.: A note on the effect of the hypodermic injection of adrenalin chloride solution.—Lancet, 1914, v. 187, p. 158–159.

Roth, O.: On the reactions of the human heart to adrenalin.—Deutsch. med. Wchnschr. 1914, v. 40, p. 905–907. See also Rohmer, P.: Münch. med. Wchnschr. 1914, v. 61, p. 1336–1337.

Watson, Allan: Some observations on the effect of hypodermic injections of adrenalin on the blood pressure.—Practitioner, 1914, v. 92, p. 94–99.

Swetschnikow, W. A.: On the several requirements of the adrenalin action on peripheral vessels.—Arch. ges. Physiol. 1914, v. 157, p. 471–485.

Waller, Harold W. L.: A note on adrenalin chloride in the treatment of spasmodic asthma.—Lancet, 1914, v. 187, p. 445.

Braun, Israel: Adrenalin chloride has been found of great use in promptly checking an asthmatic attack in bronchial asthma.—Merck's Arch. 1914, v. 16, p. 106.

van Zandt, I. L.: Adrenalin chloride in exophthalmic goitre.—Am. Med. 1914, v. 20, p. 300–301.

Guber, A.: The use of adrenalin (suprarenin) as a physiologic antidote for morphine.—Arch. exper. Path. u. Pharmakol. 1914, v. 75, p. 333–346. See also Scoville, W. L.: Bull. Pharm. 1914, v. 28, p. 526.

Löwy, J.: Dangerous action of epinephrine in a case of Addison's disease.—(Med. Klin. v. 10, November 1, No. 44). J. Am. M. Assoc. 1914, v. 63, p. 2167.

Riethmüller, Richard H.: The practitioner can not be too urgently warned to refrain from the use of stale novocain-suprarenin solutions, which may produce very serious results.—Dental Cosmos, 1914, v. 56, p. 1324.

For additional references on adrenalin see Index Med.; J. Am. M. Assoc.; Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; Zentralbl. Biochem. u. Biophys.; Zentralbl. exper. Med.

ERGOTA.

U. S. P., IX: The carefully dried sclerotium of *Claviceps purpurea*, with not more than 5 per cent of harmless seeds, fruits, and other foreign matter. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 377, and Abstr. Prop. Changes, Part 2, 1914, p. 19.

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Gehe & Co.: The production of ergot during the year 1913 was again normal and prices have been correspondingly reduced.—Handelsbericht, 1914, p. 116.

Tunmann, O.: There is no distinct market for ergot apart from New York, which imports annually, directly from Spain and Russia, from 60,000 to 100,000 kilograms of the drug. The Hamburg statistics do not consider ergot of sufficient importance to be listed separately.—Apoth.-Ztg. 1914, v. 29, p. 92.

Mann, E. W.: A very high average of water-soluble matter was reached by the 28 samples of ergot examined during the two years, the figures also affording evidence of a very wide variation. The water-soluble matter ranged from 11.7 to 23.7 per cent; average 17.5 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 14.

Linke, H.: The chemistry of ergot is not sufficiently advanced to permit of a definite standardization. The cornutine content does not give a satisfactory indication of the physiological activity of the drug.—Apoth.-Ztg. 1914, v. 29, p. 662–663.

Helch, Hans: The qualitative determination of cornutine would be an additional safeguard in connection with preparations of ergot.—Pharm. Post, 1914, v. 47, p. 580.

Wastenson, Hugo: The cornutine content of Swedish ergot and of the preparations made therefrom.—Svensk farm. Tidskr. 1914, v. 18, p. 602–605.

Vanderkleed, C. E.: Reports four assays of ergot found to vary from 0.18 to 0.31 per cent of cornutine.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Caesar & Loretz: Six samples of ergot were found to contain from 0.150 to 0.313 per cent of cornutine. Three samples of German ergot were found to contain from 0.017 to 0.050 per cent of cornutine.—Jahres.-Ber. 1914, p. 29; also Pharm. Zentralh. 1914, v. 55, p. 519.

Maines, E. L.: Ergot was found to contain from 3.40 to 4.16 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Ergot contained from 2.6 to 3.4 per cent of ash and from 14.4 to 19.9 per cent of extract soluble in 1 part alcohol and 4 parts water.—Riedel's Berichte, 1914, p. 33.

Anon.: The second supplement to the Ph. Ndl. IV is to include the international standard extract of ergot.—Pharm. Weekblad. 1914, v. 51, p. 84.

Johnson, G.: The extract of ergot of the Ph. Norv. IV.—Norges Apotek. Tidsskr. 1914, v. 22, p. 12.

Strode, Sylvanus E.: Of two samples of fluid extract of ergot examined, one was not passed.—Rep. Ohio D. & F. Div. 1914, p. 118.

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Caesar & Loretz: One sample of fluid extract of ergot was found to have a specific gravity of 1.091 and contain 2.70 per cent ash and 24.45 per cent of extract.—Jahres-Ber. 1914, p. 38.

E'we and Vanderkleed: Fluid extract of ergot was found to form precipitates containing lead.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1685.

Duncan, Chester A.: Popular review of the methods employed in the physiological standardization of ergot.—Southern Pharm. J. 1914, v. 6, p. 343.

Pittenger and Vanderkleed: A new uterus-contracting method of testing ergot, with comparison with the blood-pressure method.—J. Am. Pharm. Assoc. 1914, v. 3, p. 925–932.

Caesar & Loretz: The valuation of ergot, with tables showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 100–102. See also p. 27.

Salant and Harris: Some observations on the action of ergot.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 21–22. See also Salant and Hecht: J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 517.

Haskell, Chas. C.: The physiological activity of "Ergotin" and powdered extract of ergot.—J. Am. Pharm. Assoc. 1914, v. 3, p. 786–791.

Guggenheim, M.: The action of beta-imidazolylethylamine on the human uterus.—Therap. Monatsh. 1914, v. 28, p. 174–175.

Niculescu, Petre: The relation of the physiological actions of hypophysis extract, adrenin, ergot preparations and imidazolylethyl amine.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 1–11. See also Borruttau, H., p. 11–12, and Frölich and Pick: Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 114–118.

Jackson, D. E.: The action of certain drugs on the bronchioles. Ergotoxine possesses no very marked specific action of its own on the bronchioles.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 479–510.

Morse, W. H.: An active preparation of ergot will facilitate labor, control hemorrhage, and meet the rationale of a widely diversified indication.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 247–249.

Rosenbloom and Schildecker: The successful isolation of ergotinin crystals from certain organs in a case of acute ergot poisoning.—J. Am. M. Assoc. 1914, v. 63, p. 1203–1204.

ERIODICTYON.

U. S. P. IX: The leaves may include not more than 5 per cent of stems or other foreign matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 378, and Abstr. Prop. Changes, Part 2, 1914, p. 20.

Editorial: California balm grows well on the waste and arid hillsides along the coast. It could be grown where little else would thrive. Gathering and marketing is easy and simple.—Pacific Pharm. 1914, v. 7, p. 297.

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ESSENTIA PEPSINI, N. F.

Norwood, T. W.: A reduction of the amount of wine in essence of pepsin to 18 ounces or less per gallon would give it less of the appearance and taste of wine of pepsin.—Drug. Circ. 1914, v. 58, p. 390.

Whitney, M. N.: In nine samples of essence of pepsin examined, the albumen converted by 4 cc. of the preparation was found to vary from 1,330 to 3,330. Only one of the preparations was below 3,000.—Proc. Missouri Pharm. Assoc. 1914, p. 104.

Ziefle, Adolph: Of 77 samples of essence of pepsin, all but 3 were found to be less than 90 per cent of the official strength.—Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 132–134.

Congdon, Leon A.: Six samples of essence of pepsin; all not standard.—Rep. Kansas Bd. Health, 1914, p. 100.

Todd, A. R.: Six samples of essence of pepsin were examined, all of which were found to be adulterated or illegal.—Bull. Michigan D. & F. Dept. 1914, January–February, p. 17, July–August, p. 26, September–October, p. 16.

Todd, A. R.: Of 14 samples of essence of pepsin examined, 3 were found to be adulterated.—Rep. Michigan D. & F. Com. 1914, p. 176.

ETHYL-MORPHINE HYDROCHLORIDE.

Anon.: The second supplement to the Ph. Ndl. IV describes di-ethyl-morphine hydrochloride, or dionin, as melting at about 120°. On drying at 105°, it should lose not less than 8, nor more than 10 per cent of its weight.—Pharm. Post, 1914, v. 47, p. 125. See also Pharm. Weekblad, 1914, v. 51, p. 79–80.

Jensen, H. R.: The only sample of ethyl morphine hydrochloride tested had an apparent melting point at 123° and was insoluble in ether.—Evans' An. Notes, 1914, v. 31.

Linke, H.: The red color produced by the action of nitric and sulphuric acid with ferric chloride appears only after the mixture is allowed to cool.—Apoth.-Ztg. 1914, v. 29, p. 683.

Kollo, Konstantin: Ampoules of ethyl morphine hydrochloride may be Tyndallized for three days at from 90° to 100°. Many of the available commercial products are not absolutely neutral in reaction and will not yield a colorless solution.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

EUCALYPTOL.

Dodge, Francis D.: A further note on the determination of cineol. The phosphoric acid and the resorcinol processes are of little use in the presence of camphor or terpineol. The permanganate method, as described, is not satisfactory, for oils containing less than 50 per

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cent of cineol.—J. Ind. & Eng. Chem. 1914, v. 6, p. 863–864. See also Pharm. Zentralh. 1914, v. 55, p. 729.

Turner and Holmes: For the determination of cineol, suggest an arsenic acid quantitative method which depends upon the formation of cineol arsenate.—Pharm. Era, 1914, v. 47, p. 574.

E'we, G. E.: One sample of eucalyptol examined contained a little eucalyptus oil. Its specific gravity was 0.9196, instead of 0.9210.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 138.

Jensen, H. R.: One sample of eucalyptol had: Specific gravity, 0.9285; refractive index, 1.458; optical rotation, 0°.—Evans' An. Notes, 1914, p. 31.

Fromm and Fluck: Iodine containing derivatives of cineol.—Ann. Chem. 1914, v. 405, p. 175–180.

Berliner: The treatment of pneumonia, pleuritis, and bronchitis with menthol and eucalyptol.—Deutsch. med. Wchnschr. 1914, v. 40, p. 2100.

EUCALYPTUS.

U. S. P. IX: The leaves may include not more than 3 per cent of stems, fruits, and other foreign matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 378, and Abstr. Prop. Changes, Part 2, 1914, p. 20.

Editorial: The Australian Government and eucalyptus cultivation.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 5.

Baker and Smith: The correlation between the specific characters of the Tasmanian and Australian eucalyptus. An abstract.—Chem. News, 1914, v. 110, p. 126.

A book review calls attention to Parts XVIII to XXI, inclusive, of a volume entitled "A Critical Revision of the Genus Euclyptus," by J. H. Maiden.—Am. J. Pharm. 1914, v. 86, p. 479.

EUGENOL.

Albright, Alan R.: The hydrogen number of eugenol was found to be 134.4; the per cent of active constituent, 98.3; theoretical per cent of active constituent, 100.—J. Am. Chem. Soc. 1914, v. 36, p. 2202.

EUONYMUS.

U. S. P. IX: The bark may not include more than 3 per cent of wood and other foreign matter. The amount of calcium oxalate in different specimens shows some variation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 379, and Abstr. Prop. Changes, Part 2, 1914, p. 21.

Rippetoe, J. R.: One sample of euonymus was found to contain 18.73 per cent of alcohol (73 per cent) extract and 7.70 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 438.

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U. S. P. IX: One gm. of the powdered extract to represent 4 gm. of the drug. Dried starch to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 535, and Abstr. Prop. Changes, Part 3, 1914, p. 12.

Blackwood, Alexander L.: Euonymus atropurpureus; observations on the action of this agent on 12 persons.—J. Am. Inst. Homœop. 1914, v. 7, p. 420–424.

EUPATORIUM.

Rippetoe, J. R.: One sample of eupatorium was found to contain 22.80 per cent of alcohol (49 per cent) extract and 9.07 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

EXTRACTA.

U. S. P. IX: Changes and new standards and requirements for official extracts with directions for making powdered extracts.—J. Am. Pharm. Assoc. 1914, v. 3, p. 533–538, and Abstr. Prop. Changes, Part 3, 1914, p. 10–15.

Mittelbach, William: In the new Pharmacopœia most of the old solid extracts in mass form will be replaced by the powdered form. This is good; powdered extracts are more satisfactory in all respects.—Proc. Missouri Pharm. Assoc. 1914, p. 106.

Grosh, Daniel M.: The commercial production of powdered extracts.—Nat. Druggist, 1914, v. 44, p. 452.

Curry, Gordon L.: Of the official extracts, the aqueous extracts and those made by evaporation of the fluid extract should be made in the retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 57. See also Llewellyn, H. D.: Proc. Missouri Pharm. Assoc 1914, p. 142.

Anon.: The introduction of the use of the vacuum pan in the making of extracts.—Pharm. Era, 1914, v. 47, p. 264–265.

Fernau, Albert: Tinned copper pans usually contaminate the extract with tin. Apparatus of aluminum is to be preferred for the making of vegetable extracts.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 242.

Steinhorst, H.: The testing of official Ph. Germ. V extracts for heavy metals and the need for avoiding containers of tin and lead.—Apoth.-Ztg. 1914, v. 29, p. 39.

Anselmino, O.: An illustrated description of an apparatus for determining the water content of extracts.—Arb. Pharm. Inst. Berl. 1914, p. 237–238.

Anon.: A compilation of criticisms of the Ph. Germ. V extracts.—Pharm. Zentralh. 1914, v. 55, p. 601ff.

Pescitelli, Luigi: The use of tinctures and of extracts in therapy.—Boll. chim.-farm. 1914, v. 53, p. 335–343.

Extract of beef.—Cook, F. C.: Partition of the nitrogen of plant, yeast, and meat extracts.—J. Am. Chem. Soc. 1914, v. 36, p. 1551–1556.

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Sauer, Fr. G.: Nature and composition of Liebig's meat extract.—Pharm. Ztg. 1914, v. 59, p. 866–867.

Scoville, W. L.: Beef extract contained from 7.4 to 17.88 per cent of salt.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Thompson, W. H.: Nutrition and meat extracts. A controversy.—Brit. M. J. 1914, v. 2, p. 738. See also Thompson, W. H., p. 902; Sohn, Charles E., p. 1000; Haddon, John, p. 1088.

Extractum ferri pomatum, N. F.—Rupp, E.: Outline of method for determining the iron content of ferrated extract of apples.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 314.

FEL BOVIS.

E'we, G. E.: Of 11 lots of powdered oxgall examined, 5 contained large quantities of corn starch, 1 as much as 13.5 per cent; the other 8 lots were only partly soluble in water. Powdered oxgall seems to be simply dried without preparation with alcohol.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 152.

U. S. P. IX: Powdered extract of oxgall to replace purified oxgall. One gm. of powdered extract to represent 8 gms. of oxgall. Dried starch is to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 535, and Abstr. Prop. Changes, Part 3, 1914, p, 12.

FERRI CARBONAS SACCHARATUS.

Hill, C. A.: Of 11 samples of saccharated ferrous carbonate examined during the years 1912 and 1913 the arsenic content varied from 0.4 to 7 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

FERRI CHLORIDUM.

U. S. P. IX: Liquor ferri chloridi to include test for absence of salts and fixed alkalies, to read: "Residue on evaporation, not more than 0.1 per cent." Method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 528, and Abstr. Prop. Changes, Part 3, 1914, p. 5.

E'we, G. E.: One lot of iron chloride solution assayed 10.48 per cent metallic iron, 0.4 per cent salts of fixed alkalies, and had a specific gravity of 1.32, which is higher than that required by the U. S. P., namely, 1.29.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 142.

Hill, C. A.: Of 80 samples of solution of ferric chloride examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0.5 to 10.6 parts per million.—Chem. & Drug, 1914, v. 85, p. 21.

U. S. P. IX: Rubric for tincture of ferric chloride to read not less than 13 per cent on anhydrous salt corresponding to 4.6 of metallic iron. Specific gravity about 1.000. Modified method of assay.—J. Am. Pharm. Assoc. 1914, v. 3, p. 545, and Abstr. Prop. Changes, Part 3, 1914, p. 22.

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Table showing some of the analytical results reported for tincture of ferric chloride.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E	4	3	Rep. Indiana Bd. Health, 1914, p. 442.
Brown, L. A	44	26	Proc. Kentucky Pharm. Assoc., 1914, p. 117.
Brown, Lucius P	6	1	Bull. Tennessee F. & D. Dept., 1914, v. 1, No. 2, p. 3.
Frary, Guy G	27	8	Rep. South Dakota F. & D. Com., 1914, p. 225, 226
Ladd, E. F	52	21	Bull. North Dakota Exper. Sta. F. Dept., 1914, v. 3, p. 43–44.
Lythgoe, Hermann C	5	1	Rep. Massachusetts Bd. Health, 1913, 1914, p. 411.
Stallings, R. E	4	2	Month. Bull. Georgia Dept. Agric., 1914, v. 1, p. 18.
Wiedemann, H. E	51	39	Rep. Missouri F. & D. Com., 1914, p. 27–28.

FERRI ET QUININÆ CITRAS.

Rupp, E.: Outline of method for determining the quinine content of iron and quinine citrate.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 314.

Mayer, Joseph L.: The quinine content of four samples of iron and quinine citrate was found to vary from 12.31 to 14.02 per cent; the iron content from 12.96 to 15.02.—Proc. New York Pharm. Assoc. 1914, p. 115.

FERRIC GLYCEROPHOSPHATE.

Umney and Bennett: Ferric glycerophosphate should contain approximately 15 per cent of metallic iron, and should be completely soluble in 2 parts of water.—Pharm. J. 1914, v. 92, p. 135; also Year-Book of Pharmacy, 1914, p. 406.

FERRI HYDROXIDUM.

Cohen, Theodore: A new method for the preparation of colloidal ferric hydroxide.—J. Am. Chem. Soc. 1914, v. 36, p. 19–23.

Rohland, Paul: The absorption of colloidal iron hydroxide.—Ztschr. physik. Chem. 1914, v. 86, p. 633–634.

FERROUS LACTATE.

Rupp, E.: Modified method for the determination of iron in iron lactate.—Südd. Apoth.-Ztg. 1914, v. 54, p. 314; also Apoth.-Ztg. 1914, v. 29, p. 723.

FERRI PYROPHOSPHAS.

E'we, G. E.: The one sample of iron pyrophosphate examined contained 11 per cent of water.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 142.

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FERRI SULPHAS.

de Forcrand, R.: Ferrous sulphate and its hydrates.—Compt. rend. Acad. sc. 1914, v. 158, p. 20–23.

Fawsitt and Powell: The action of concentrated sulphuric acid on iron.—J. Soc. Chem. Ind. 1914, v. 33, p. 234–237.

Wirth and Bakke: The examination of the sulphates of iron. Production and properties of the several normal, basic, and acid iron sulphates. Solubility, stability, relation in water and in sulphuric acid.—Ztschr. anorg. Chem. 1914, p. 87, p. 13–46.

Jensen, H. R.: Of 28 samples of iron sulphate, 3 were unduly below the stringent official purity limit of 99.4 per cent.—Evans' An. Notes, 1914, p. 39.

Mann, E. W.: We have several times reported upon the impossibility of the 1898 Ph. Brit. standard, and note that the more reasonable figure of 97.5 per cent is not adopted. The best sample examined during the year showed 97.91 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 45.

Hill, C. A.: Of 30 samples of ferrous sulphate examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0.3 to 2 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

Baker, W. L.: Iron sulphate dried contained 33 per cent of moisture.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

FERRUM.

Burgess and Crowe: Critical ranges of pure iron. The question of the allotropy of iron.—Bull. Bur. Standards, 1914, v. 10, p. 315–370. See also Burges and Kellberg: J. Washington Acad. 1914, v. 4, p. 436–440.

Storey, Oliver W.: A microscopic study of electrolytic iron, with illustrations.—Tr. Am. Electrochem. Soc. 1914, v. 25, p. 489–528. See also Watts and Li: p. 529–536.

Corfield and Pratt: The determination of iron in the presence of phosphoric acid.—Year-Book of Pharmacy, 1914, p. 393–399.

Helch, Hans: In all iodometric iron determinations, the mixture after the addition of potassium iodide must be protected from light.—Pharm. Post, 1914, v. 47, p. 579.

Editorial: The position of iron in therapeutics. A review.—Prescriber, 1914, v. 8, p. 173–175.

Austin, J. H.: A review of recent experimental work upon the relation of iron and the iron metabolism to anemia.—Therap. Gaz. 1914, v. 38, p. 846–848.

Day and Ferguson: In the treatment of ankylostoma anemia, the administration of simple forms of iron by the mouth is more satis-

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light.—Bull. Pharm. 1914, v. 28, p. 480; also Southern Pharm. J. 1914, v. 6, p. 483.

Anon.: Fluid extracts should be kept during the entire year at as nearly uniform a temperature as possible. They should be also kept securely corked, but not in glass-stoppered bottles.—N. A. R. D. Notes, 1914, v. 18, p. 481.

Becker, I. A.: The alcoholic preparations of the Pharmacopœia—fluid extracts, tinctures, spirits, etc.—should have the alcohol content of the finished product stated definitely and so adjusted that reasonably close adherence to the process would suffice.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1025.

Pescitelli, Luigi: The use of tinctures and of extracts in therapy. A discussion of the several preparations, and a table showing the comparative content of active substances of tinctures, fluid extracts, and extracts and the relation of these preparations to the drug itself.—Boll. chim.-farm. 1914, v. 53, 335–343.

Gregory, William M.: The best results can not be expected from U. S. P. fluid extracts unless they are made from the green plant.—New York M. J. 1914, v. 99, p. 884.

FLUIDEXTRACTA, N. F.

Amos, W. S.: The proposed N. F. fluid extracts should all be included.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

Mittelbach, Wm.: The number of official fluid extracts remains about the same. It might have been very much reduced and an opening made for 50 per cent tinctures.—Proc. Missouri Pharm. Assoc. 1914, p. 107.

Roth, Richard H.: Fluid extracts, tinctures, and liquid preparations generally are best kept in amber-colored bottles away from light.—Pacific Drug Rev. 1914, v. 26, February, p. 12.

Adonis.—Mercier, L.: On the constituents of *Adonis vernalis.*—Nouv. remèdes, 1914, v. 31, p. 1–5.

Anon.: Under the title "Herba adonidis vernalis," the second supplement to the Ph. Ndl. IV is to include the upgrowing portions of *Adonis vernalis* Linn. gathered at the time of flowering.—Pharm. Weekblad, 1914, v. 51, p. 78–79.

Mercier, L. J.: A contribution to the study of the therapeutic action of *Adonis vernalis.*—Bull. gén. therap. 1914, v. 168, p. 133–136.

Agaricus.—Beringer, George M.: A proposed N. F. monograph for white agaric, or larch agaric. To boiling alcohol it should yield not less than 50 per cent of a resinous extract. Upon incineration it should yield not more than 2 per cent of a white ash, rich in phosphates.—J. Am. Pharm. Assoc. 1914, v. 3, p. 873.

Maines, E. L.: Agaric, white, was found to contain 1.29 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

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Althææ folia.—J. D. Riedel, A.-G.: Mallow leaves contained from 15.2 to 16.6 per cent of ash, and from 36.5 to 41.2 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 31.

Aletris.—Editorial: The proposed monograph for aletris, N. F., contains a grave error in that it describes part of the structures found in false unicorn root.—Pract. Drug. 1914, v. 32, p. 477.

Rippetoe, J. R.: Three samples of aletris contained from 15.85 to 19.82 per cent of alcohol (49 per cent) extract, and from 11.29 to 17.96 per cent of ash. One sample contained 85.47 per cent of insoluble ash.—Am. J. Pharm. 1914, v. 86, p. 436.

Angelica.—Editorial: Under angelica root, N. F., the European drug only is made official, yet the American drug is largely used and therefore should be included in the definition.—Pract. Drug. 1914, v. 32, p. 478.

J. D. Riedel, A.-G.: Angelica root contained from 7.4 to 12.1 per cent of ash, from 38.4 to 40.9 per cent of extract soluble in water, and from 34.2 to 40.8 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

Apii fructus.—Maines, E. L.: Celery seed was found to contain from 7.26 to 10.22 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Rippetoe, J. R.: Three samples of celery seed were found to contain from 6.32 to 25.65 per cent of alcohol extract and from 12.66 to 22.07 per cent of ash. One of the samples was adulterated with fine sand.—Am. J. Pharm. 1914, v. 86, p. 437.

Asclepias.—Beringer, George F.: A proposed N. F. monograph for asclepias, pleurisy root. The dried root of *Asclepias tuberosa* Linné.—J. Am. Pharm. Assoc. 1914, v. 3, p. 873.

Rippetoe, J. R.: Three samples of asclepias were found to contain from 19.19 to 27.80 per cent of alcohol (49 per cent) extract and from 3.51 to 6.64 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 436.

Editorial: Asclepias is a very efficient diaphoretic and broncho-pulmonic agent and while effectual is perfectly harmless.—Eclectic M. J. 1914, v. 74, p. 209–211.

Editorial: *Asclepias tuberosa*, or pleurisy root, acts nicely upon the respiratory tissues.—Phys. Drug. News, 1914, v. 9, p. 364.

Baptisia.—Beringer, George M.: A proposed N. F. monograph for Baptisia, wild indigo root. The dried root of *Baptisia tinctoria* (Linné) R. Brown.—J. Am. Pharm. Assoc. 1914, v. 3, p. 873.

Lewis, S. Judd: The ash content of a selected specimen of the root of Baptisia was found to be 3.04 per cent calculated on the dry root. The root contained 11.30 per cent of moisture.—Pharm. J. 1914, v, 92, p. 127; also Year-Book of Pharmacy, 1914, p. 364–365.

Amos, W. S.: The proposed fluid extract of Baptisia is a very satisfactory preparation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

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Boldo.—Anon.: There seems to be little doubt that boldine, the alkaloid of boldo, is one of the most valuable remedies for all chronic infections of the biliary tract at our command, and it seems unfortunate that physicians generally are not more familiar with its properties and do not resort to it more frequently.—Am. J. Clin. Med. 1914, v. 21, p. 806–807.

Bryonia.—Jensen, Dietrich: Two glucosides have been isolated from bryonia, bryonin, an inert constituent isolated by Mankowsky, and bryonidin, an active glucoside that may have cathartic properties.—Apoth.-Ztg. 1914, v. 29, p. 968.

Fearn, John: No physician can use a good preparation of bryonia without becoming more and more a believer in its therapeutic powers.—Eclectic M. J. 1914, v. 74, p. 15.

Cactus grandiflorus.—Editorial: Cactus grandiflorus, the stem is described as five to eight angled. The botanical origin should be given as *Selenocerus grandiflorus*. Cactus grandiflorus should be used as a synonym.—Pract. Drug. 1914, v. 32, p. 478.

Camillia.—Buschmann, E.: A study of the history of the development of ~~*Thea sinensis* Linné.~~—Arch. Pharm. 1914, v. 252, p. 412–420.

Anon.: Tea from new sources. The cultivation of tea in British provinces outside of India and Ceylon.—Bull. Imp. Inst. 1914, v. 12, p. 540–545.

Hanausek, T. F.: An illustrated description of a sample of tea from Asia Minor.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 259–263.

Schulte im Hofe, A.: The nature of tea, cacao, coffee, and tobacco fermentations.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 209–225.

Utz: A review of some of the recent literature relating to tea and the chemical examination of tea.—Pharm. Praxis, 1914, v. 12, p. 478–479.

Lemaire, Paul: The lead foil used for wrapping tea, a possible source of chronic lead poisoning.—Répert. pharm. 1914, v. 26, p. 49–52.

Canella.—Mann, E. W.: Two parcels of canella bark dried and ground yielded 7.26 and 5.20 per cent of ash, respectively.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 10.

Cascarilla.—J. D. Riedel, A.-G.: Cascarilla contained from 6.4 to 15.4 per cent of ash; from 17.1 to 25.3 per cent of extract soluble in water, and from 17.8 to 26.1 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Roberts, J. G.: An ash yield of 20.27 per cent was obtained from cascarilla siftings. Cascarilla bark usually yields 8 to 10 per cent of ash.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 133.

Castania.—Editorial: Under chestnut leaves, the definition specifies that the leaves be collected in September or October, while still

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green. When the leaves are dried, it would be impossible to tell whether the leaves were collected in September or August. If collected in August they would not be official.—Pract. Drug. 1914, v. 32, p. 478.

Centaurum.—Lilly, J. K.: The American and European centaury are constantly confused.—Proc. N. W. D. A. 1914, p. 264; also Oil, Paint & Drug. Rep. 1914, v. 86, September 30, p. 35.

J. D. Riedel, A.-G.: Centaurum contained from 4.9 to 6.7 per cent of ash and from 37.6 to 43.8 per cent of extract soluble in water.—Riedels' Berichte, 1914, p. 32.

Coffea.—Brindley, J. H.: The commercial aspect of coffee. Historical review.—Simmon's Spice Mill, 1914, v. 37, p. 337–342, 451–454, 574–578, 685-686, 786–788, 901–904, 1014–1016.

Small, W.: Coffee cultivation in Uganda. A review of the methods employed.—Bull. Imp. Inst. 1914, v. 12, p. 242–250.

Morstatt, H.: The cultivation of coffee and harmful insects in the district of Bukoba.—Pflanzer, 1914, v. 10, p. 133–147.

Bertrand and Weisweiller: The composition of essence of coffee. The presence of pyridine. Bull. soc. chim. France, 1914, v. 15, p. 94–96.

Fendler and Stüber: The determination of caffeine in coffee. A comparison of the several methods that have been proposed. A new and simplified method for roasted coffee.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, pp. 9–20; also Südd. Apoth.-Ztg. 1914, v. 54, p. 535–536.

Utz: A review of some of the recent literature relating to coffee and the chemical examination of coffee.—Pharm. Praxis, 1914, v. 12, p. 478-479.

Schulte im Hofe, A.: The nature of tea, cacao, coffee, and tobacco fermentations.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 209–225.

Abelin and Perelstein: The volatile constituents of coffee. A contribution on the chemical composition and pharmacological action of the volatile constituents.—Münch. med. Wchnschr. 1914, v. 61, p. 867–868.

Anon.: The chemistry of a cup of coffee and a comparison between coffee and tea. Some observations on the effects of roasting and on the strength of cold water extracts of coffee compared with the strength of boiling water extracts.—Am. J. Pharm. 1914, v. 86, p. 216–222.

Larson, Alf.: Coffee and alcohol. A table showing the importation of coffee from 1861–1913. A second table showing the average consumption of coffee in several European countries. Also tables showing the production of alcoholic beverages.—Svensk. Kem. Tidskr. 1914, v. 26, p. 33–45.

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Cornus.—Maines, E. L.: Dogwood was found to contain from 9.99 to 11.47 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Rippetoe, J. R.: Three samples of Jamaica dogwood were found to contain from 9.63 to 16.64 per cent of alcohol (65 per cent) extract and from 8.10 to 13.63 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 438.

Coto.—Lilly, J. K.: Little bark answering to the description of coto bark is obtainable.—Proc. N. W. D. A. 1914, p. 263; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Caesar & Loretz: The qualitative determination of cotoin.—Jahres-Ber. 1914, p. 60.

Damiana.—Rippetoe, J. R.: Two samples of damiana were found to contain 19.25 and 21.41 per cent of alcohol extract, and 18.91 and 8.66 per cent of ash, respectively. One sample contained sand.—Am. J. Pharm. 1914, v. 86, p. 438.

Roberts, J. G.: A physical examination of three samples of damiana leaves showed that all of them contained an excessive amount of stems.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 137.

Delphinium.—Beringer, George M.: A proposed N. F. monograph for delphinium, larkspur seed. The dried seeds of *Delphinium consolida* Linné and *Delphinium ajacis* Linné.—J. Am. Pharm. Assoc. 1914, v. 3, p. 874.

Rippetoe, J. R.: Six samples of larkspur seed were found to contain from 19.52 to 44.75 per cent of alcohol extract, and from 5.19 to 6.67 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

Anon.: For tincture of larkspur the dried drug should be used, and never the whole seed. Pure 95 per cent alcohol, and not a weaker one, should be used for the menstruum.—Drug. Circ. 1914, v. 57, p. 669.

Williams, J. B.: The insecticidal value of fluid extract of larkspur seed. From the results observed, it would appear that it is the oil, and not the alkaloid, to which larkspur seed owes its insecticidal properties.—Merck's Rep. 1914, v. 23, p. 297.

Dioscorea.—Beringer, George M.: A proposed N. F. monograph for dioscorea, wild yam root. The dried rhizome of *Dioscorea villosa* Linné.—J. Am. Pharm. Assoc. 1914, v. 3, p. 874.

Lloyd, John Uri: Characteristics and constituents of dioscorea.—Eclectic M. J. 1914, v. 74, p. 228.

Puckner, W. A.: *Dioscorea villosa* (wild yam) contains a saponin and an acrid, irritant resin. It has never been proved clinically or experimentally that this drug has any action whatever except that its irritant resin might, if taken in sufficient quantity, cause irritation of the stomach and vomiting.—Rep. Council Pharm. Chem. 1914, p. 97.

Bettencourt, M. F.: The use of dioscorea in simple intestinal colic.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 333.

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Echinacea.—Heyl and Staley: Analyses of two echinacea roots, with report of experimental observations.—Am. J. Pharm. 1914, v. 86, p. 450–455.

Maines, E. L.: Echinacea root was found to contain from 4.87 to 6.05 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Puckner, W. A.: A report on Echtisia, Ecthol, and Echitone, three widely advertised complex preparations containing echinacea.—Rep. Council Pharm. Chem. 1914, p. 80–85.

Editorial: Echinacea cures catarrhs when given internally.—Phys. Drug News, 1914, v. 9, p. 363.

Fearn, John: No remedy ever introduced into the practice of medicine has gained such use or accomplished so much good in the same period of time as echinacea.—Eclectic M. J. 1914, v. 74, p. 177–181.

Ellingwood, Finley: Echinacea: the vegetable "antitoxin." Its characteristics and peculiar therapeutic effects.—Am. J. Clin. Med. 1914, v. 21, p. 987–993.

Euphorbia pilulifera.—Lilly, J. K.: Euphorbia pilulifera frequently contains an excess of foreign plant parts, such as grass, leaves, pieces of wood, etc.—Proc. N. W. D. A. 1914, p. 264; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 35.

Maines, E. L.: Euphorbia was found to contain from 8.33 to 21.66 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Rippetoe, J. R.: One sample of euphorbium was found to contain 41.93 per cent of alcohol extract and 14.25 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

Gemmæ populi.—Beringer, George M.: A proposed N. F. monograph for gemmæ pouli, balsam poplar buds; balm of Gilead buds. The air-dried winter leaf buds of *Populus nigra* Linné, collected early in the spring. Balsam poplar buds should be kept in a tightly closed container of glass or tin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 874.

Maines, E. L.: Balm of Gilead buds were found to contain from 1.84 to 2.41 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Helonias.—Rippetoe, J. R.: Three samples of helonias dioica were found to contain from 28.07 to 31.36 per cent of alcohol (49 per cent) extract, and from 3.6 to 7.7 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

Ritter, E. N.: Helonias, in medicinal doses, is an excellent remedy in uterine disorders. It is a good gastro-intestinal tonic and a mild diuretic.—Ellingwood's Therap. 1914, v. 8, p. 222.

Editorial: There is no agent in materia medica surer in its action, in the direct line of its indications, than helonias. Also known as false unicorn.—Ellingwood's Therap. 1914, v. 8, p. 393.

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Hydrangea.—Beringer, George M.: A proposed monograph for hydrangea, the dried rhizome of *Hydrangea arborescens.*—J. Am. Pharm. Assoc. 1914, v. 3, p. 1597.

Maines, E. L.: Hydrangea root was found to contain from 2.91 to 5.18 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Rippetoe, J. R.: One sample of hydrangea was found to contain 13.63 per cent of alcohol (49 per cent) extract and 8.25 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

Ignatia.—Vanderkleed, C. E.: Reports three assays of ignatia; from 1.32 to 1.83 per cent of total alkaloids; two above and one below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Roberts, J. G.: A two-bag shipment of ignatia bean contained a satisfactory amount of alkaloid, but was considered of inferior quality on account of the presence of 25 per cent of worm-eaten beans.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 142.

Editorial: Ignatia is a homœopathic remedy for changeable moods; better for women, as nux is for men.—Ellingwood's Therap. 1914, v. 8, p. 196.

Inula.—Beringer, George M.: A proposed monograph for inula, the dried rhizome and roots of *Inula helenium*, with not more than 5 per cent of stem bases.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1598.

Senft, Em.: An illustrated description of the determination of phytomelane in the root of *Inula helenium.*—Pharm. Post, 1914, v. 47, p. 207–209.

Iris.—Beringer, George M.: A proposed monograph for orris, the rhizome of *Iris florentina*, *I. Germanica* and *I. pallida*, freed from the roots, peeled and dried. Ash should not exceed 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1598.

Roure-Bertrand Fils: Orris roots must remain three years in the ground before attaining their normal development.—Sc. & Ind. Bull. April, 1914, p. 53.

Maines, E. L.: Orris root was found to contain 2.69 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Rippetoe, J. R.: One sample of orris root was found to contain 1.58 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

J. D. Riedel, A.-G.: Iris contained from 1.9 to 2.2 per cent of ash and from 21.9 to 23.4 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

Juglans.—Beringer, George M.: A proposed N. F. monograph for juglans, juglans; butternut bark. The dried bark of the root of *Juglans cinerea* Linné.—J. Am. Pharm. Assoc. 1914, v. 3, p. 874.

Juniperus.—Beringer, George M.: A proposed N. F. monograph for juniperus, juniper berries. The carefully dried ripe fruit of *Juniperus communis* Linné. Juniper berries should be kept in air-

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tight or glass containers. Old or insect-infested fruit should not be used.—J. Am. Pharm. Assoc. 1914, v. 3, p. 874.

Roberts, J. G.: A physical examination of two lots of juniper berries revealed a condition of inferiority due to the presence of low-grade berries.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 143.

Anon.: The chapter on minor botany illustrates and describes *Juniperus communis*.—Chem. & Drug. 1914, v. 84, p. 108.

Maines, E. L.: Juniper berries were found to contain from 3.17 to 3.82 per cent of ash.—J. Am. Pharm. Assoc. 1914, p. 425.

Rippetoe, J. R.: Two samples of juniper berries were found to contain 40.15 and 28.12 per cent of alcohol (49 per cent) extract and 3.25 and 3.27 per cent of ash, respectively.—Am. J. Pharm. 1914, v. 86, p. 439.

J. D. Riedel, A. G.: Juniper berries contained from 3 to 4.1 per cent of ash and from 42.9 to 53.7 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Kava kava.—E'we and Vanderkleed: Precipitation of active principles in fluid extract of kava kava.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 275.

Borsche and Gerhardt: The constituents of kava kava.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2902; also Apoth.-Ztg. 1914, v. 29, p. 927.

J. D. Riedel, A. G.: The constituents of kava kava and the chemical constitution of yangonin.—Südd. Apoth.-Ztg. 1914, v. 54, p. 221. See also Pharm. Ztg. 1914, v. 59, p. 284–285, and Pharm. Post, 1914, v. 47, p. 219–220.

Kola.—Carles, P.: Report of experiences with the alkaloids of kola nut.—Répert. pharm. 1914, v. 26, p. 241–244.

Neal, P. C.: Of six samples of kola nut examined all were accepted.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

Caesar & Loretz: The valuation of kola, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 90.

Vanderkleed, C. E.: Reports nine assays of dried kola nut, from 1.09 to 1.78 per cent alkaloid.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Patch, E. L.: Kola contained from 1.4 to 2.24 per cent alkaloid.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1288.

Caesar & Loretz: Five samples of kola were found to contain from 1.54 to 2.01 per cent of alkaloid.—Jahres-Ber. 1914, p. 39.

Dufilho, E.: The extraction of kola.—Farm. Españ. 1914, v. 46, p. 823–824.

Glücksmann, C.: Some new identification reactions for fluid extract of cola.—Pharm. Praxis, 1914, v. 12, p. 505–517.

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Anon.: The consumption of kola, particularly on the part of athletes and tourists is constantly increasing.—Südd. Apoth.-Ztg. 1914, v. 54, p. 347.

Menyanthes.—Beringer, George M.: A proposed N. F. monograph for Menyanthes, menyanthes leaves; buckbean; marsh trefoil. The dried leaves of *Menyanthes trifoliata* Linné. Ash not more than 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 875.

Passiflora.—Beringer, George M.: A proposed N. F. monograph for Passiflora, passion flower; passion vine. The dried herbage of *Passiflora incarnata* Linné, collected after some of the berries have matured. Ash not over 12 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 877.

Havaland, H. G.: Manufacturers and dealers frequently label Passiflora, "passion flower" or "May pop."—Drug Circ. 1914, v. 58, p. 349.

Maines, E. L.: Passion flower herb was found to contain from 9.12 to 9.22 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Editorial: Passiflora relieves uncomplicated insomnia.—Phys. Drug News, 1914, v. 9, p. 363.

Petroselinum.—Beringer, George M.: A proposed monograph for parsley root, the root of *Petroselinum sativum.* Ash should not exceed 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1599.

Pimpinella.—Beringer, George M.: A proposed monograph for pimpernal root, the dried rhizome and roots of *Pimpinella saxifraga* or *P. magna.*—J. Am. Pharm Assoc. 1914, v. 3, p. 1599.

Tunmann, O.: The structural characteristics of pimpinella and the appearance of pimpinellin under the microscope.—Apoth.-Ztg. 1914, v. 29, p. 728-730.

J. D. Riedel, A.-G.: Pimpinella contained from 5.3 to 6.5 per cent of ash, and from 18.2 to 23.1 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

Pinus alba.—Maines, E. L.: White pine bark was found to contain from 1.09 to 2.04 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

Sambucus.—Beringer, George M.: A proposed N. F. monograph for Sambucus, sambucus; elder flowers. The air-dried flowers of *Sambucus canadensis* Linné or of *Sambucus nigra* Linné, separated from the peduncles and pedicels. Ash white and not more than 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 877.

Henkel, Alice: An illustrated description of *Sambucus canadensis* L.—Phys. Drug News, 1914, v. 9, p. 160; also Spatula, 1914, v. 20, p. 473.

J. D. Riedel, A.-G.: Sambucus contained from 8.8 to 10.7 per cent of ash and from 36.4 to 40.3 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 31.

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Senecio.—Beringer, George M.: A proposed N. F. monograph for Senecio, senecio; life root. The dried overground portions of *Senecio aureus* Linné, gathered when flowering.—J. Am. Pharm. Assoc. 1914, v. 3, p. 877.

Trifolium.—Beringer, George M.: A proposed N. F. monograph for Trifolium, trifolium; red clover blossoms. The dried flowering heads of *Trifolium pratense* Linné.—J. Am. Pharm. Assoc. 1914, v. 3, p. 879.

Trillium.—Beringer, George M.: A proposed N. F. monograph for Trillium, beth root. The dried rhizome of *Trillium erectum* Linné and closely allied species of *Trillium.* Ash not more than 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 879.

Verbascum.—Beringer, George M.: A proposed monograph for mullein flowers, the dried corollas with adhering stamens of *Verbascum phlomoides* or of *V. thapsiforme.*—J. Am. Pharm. Assoc. 1914, v. 3, p. 1597.

Holm, Theo.: An illustrated description of the structural characteristics of *Verbascum thapsus* L., a common mullein.—Merck's Rep. 1914, v. 23, p. 4–5. See also Henkel, Alice: Phys. Drug. News, 1914, v. 9, p. 159, and Spatula, 1914, v. 20, p. 472.

Rippetoe, J. R.: One sample of mullein was found to contain 16.10 per cent of alcohol (49 per cent) extract and 15.28 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

J. D. Riedel, A.-G.: Verbascum contained from 4.4 to 6.3 per cent of ash and from 48.7 to 52.1 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 31.

Verbena.—Beringer, George M.: A proposed N. F. monograph for Verbena, verbena; blue vervain. The dried overground portion of *Verbena hastata* Linné collected when flowering.—J. Am. Pharm. Assoc. 1914, v. 3, p. 879.

FLUID GLYCERATES.

Smith, Ernest R.: The fluid glycerates as a class possess many advantages over the fluid extracts, but it is to be determined as yet whether the glycerol water menstruum and chloroform water dissolves any of the undesirable constituents of the drug.—Nat. Druggist, 1914, v. 44, p. 167.

Amos, W. S.: The proposed fluid glycerates should be increased in number. The several formulas, with the single exception of fluid glycerate of cascara, were satisfactory.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

FŒNICULUM.

U. S. P. IX: The dried ripe fruit of cultivated varieties with not more than 2 per cent of harmless foreign matter. Ash not exceed-

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ing 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 379, and Abstr. Prop. Changes, Part 2, 1914, p. 21.

Alsberg, C. L.: Fennel should contain not less than 96 per cent of sound fennel seed nor more than 9 per cent of ash.—S. R. A.-Chem. 1914, p. 529; also Drug. Circ. 1914, v. 58, p. 545, and Oil, Paint & Drug Rep. 1914, v. 86, July 27, p. 11.

Plahl, Wilhelm: The detection of extracted fennel seed; considerable reliance may be placed on the odor and taste of the individual seed.—Arch. Chem. Mikors. 1914, v. 7, p. 209–211.

Maines, E. L.: Fennel seed was found to contain from 7.85 to 8.40 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Mann, E. W.: In five samples of the powder, the mineral matter ranged from 6.86 to 10.70 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 14.

J. D. Riedel, A.-G.: Fennel contained from 7 to 9.7 per cent of ash and from 28 to 32.1 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Linke, H.: Powdered fennel is frequently adulterated, and samples are met with that exceed the maximum of 10 per cent of ash. The 10 samples examined were found to vary from 8.5 to 23 per cent of ash.—Seven of them exceeded the pharmacopœial limit.—Apoth.-Ztg. 1914, v. 29, p. 541.

FRANGULA.

U. S. P. IX: Description somewhat elaborated. Ash not exceeding 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 380, and Abstr. Prop. Changes, Part 2, 1914, p. 22.

Gathercoal, E. N.: A criticism of the chemical tests for frangula and rhamnus purshiana as proposed for the new U. S. P.—J. Am. Pharm. Assoc. 1914, v. 3, p. 982–983.

E'we, G. E.: One sample of buckthorn bark, so labeled, proved to be wild cherry bark.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 131.

Lilly, J. K.: Complete substitution with an unknown bark has been noted on two occasions in samples of buckthorn bark. This same bark was noted several years ago in cascara sagrada.—Proc. N. W. D. A. 1914, p. 263; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Maines, E. L.: Buckthorn bark was found to contain from 5.15 to 5.84 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Rippetoe, J. R.: One sample of frangula was found to contain 24.50 per cent of alcohol (38 per cent) extract and 5.24 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

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J. D. Riedel, A.-G.: Frangula contained from 3.7 to 6.5 per cent of ash and from 25.8 to 29.1 per cent of extract soluble in 3 parts alcohol and 7 parts water.—Riedel's Berichte, 1914, p. 31.

GALLA.

U. S. P. IX: Excrescence on the young twigs of *Quercus infectoria* and other allied species of *Quercus*. Description elaborated, including a qualitative test.—J. Am. Pharm. Assoc. 1914, v. 3, p. 380, and Abstr. Prop. Changes, Part 2, 1914, p. 22.

Tunmann, O.: Table showing the imports and exports of galls into and from Hamburg. Also table showing origin of the drug.—Apoth.-Ztg. 1914, v. 29, p. 90–91.

Gehe & Co.: Table showing the production of galls in several countries during the years 1904 to 1911, inclusive.—Handelsbericht, 1914, p. 83.

Anon.: Galls and their tannins. A review of the paper by Feist and Haun.—Chem. & Drug. 1914, v. 84, p. 37.

Roberts, J. G.: Tannic acid determinations made on two samples of nutgalls showed the presence of 40.3 and 52.1 per cent, respectively. Samples containing less than 50 per cent of tannic acid are undesirable and therefore are rejected.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Jensen, H. R.: One sample of galls had tannic acid 56 per cent; moisture, 11.4 per cent.—Evans' An. Notes, 1914, p. 34.

Rippetoe, J. R.: One sample of nutgall was found to contain 72.95 per cent of alcohol extract and 1.90 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

Mann, E. W.: Five batches of powdered galls yielded from 1.07 to 1.63 per cent of ash.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 14.

Linke, H.: Five samples of galls varied from 1.64 to 2.28 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 541.

J. D. Riedel, A.-G.: Galls contained from 1.6 to 2.9 per cent of ash and from 72.1 to 78.4 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

GAMBIR.

U. S. P. IX: A dried extract prepared from decoctions of the leaves and twigs of *Ourouparia Gambir*. Ash not exceeding 9 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 381, and Abstr. Prop. Changes, Part 2, 1914, p. 23.

Sommerhoff and Apostolo: A note on Chinese gambir.—Ann. chim. applicata, 1914, v. 2, p. 246–251.

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E'we and Vanderkleed: A note on soft gambir. This substance contains an excessive amount of water and the amount used in a formula should be corrected so as to comply with the U. S. P. requirements.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1685. See also Stockinger, R.: Proc. Pennsylvania Pharm. Assoc. 1914, p. 138.

Roberts, J. G.: One lot of gambir, in cube form, contained 74.33 per cent of alcohol soluble matter and yielded 4.52 per cent of ash.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 139.

Rippetoe, J. R.: Fifteen samples of gambir contained from 63.30 to 87.00 per cent of alcohol extract, average 78.6 per cent; aqueous extract, 61.7 to 82.75 per cent, average 77.95 per cent; ash, 3.40 to 8.48 per cent, average, 5.55 per cent.—Am. J. Pharm. 1914, v. 86, p. 444.

Hankey, William T.: Of seven samples of catechu examined, two were rejected. The ash content was found to vary from 3.65 to 5.55 per cent.—Proc. Ohio Pharm. Assoc. 1914, p. 45.

Mann, E. W.: In fixing ash limits for catechu, the 1914 Ph. Brit. introduces an innovation, in that 5 per cent is given as the maximum ash allowable for the entire drug, and as much as 8 per cent for the powder.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 11.

Lefeldt, M.: The Ph. Germ. V should include a requirement for alcohol soluble constituents in tincture of catechu.—Pharm. Ztg. 1914. v. 59, p. 43.

GELATINUM.

U. S. P. IX: Description modified. Ash to read not more than 3 per cent. Tests for heavy metals and arsenic added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1570, and Abstr. Prop. Changes, Part 6, 1914, p. 8.

Alsberg, Carl L.: The results of investigation show the presence in gelatin of such metallic impurities as zinc, copper, arsenic, and lead. The cause of these impurities has been shown to be the action of sulphurous acid on the zinc and copper containers during manufacture.—Am. Food J. 1914, v. 9, p. 22.

Eder and Valenta: The available commercial gelatin is usually contaminated by traces or more of sulphurous acid or sulphates.—Chem. Ind. 1914, v. 37, p. 39. See also Linke, H.: Apoth.-Ztg. 1914, v. 29, p. 683.

Baker, W. L.: Three lots of gelatin were rejected on account of color.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Hankey, William T.: Of 17 samples of gelatin examined, 13 were rejected.—Proc. Ohio Pharm. Assoc. 1914, p. 45.

Lansens, J.: Ovules of tannin with directions for making the gelatin base.—Ann. Pharm. Louvain, 1914, v. 20, p. 1–2.

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GELSEMIUM.

U. S. P. IX: Monograph elaborated, including a description of the powder.—J. Am. Pharm. Assoc. 1914, v. 3, p. 381, and Abstr. Prop. Changes, Part 2, 1914, p. 23.

Lloyd, John Uri: Characteristics and constituents of gelsemium.—Eclectic M. J. 1914, v. 74, p. 227.

Maines, E. L.: Gelsemium root was found to contain from 2.24 to 2.59 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Sayre, L. E.: Further study of the alkaloid gelseminine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 314–315. See also Merck's Rep. 1914, v. 23, p. 8–9.

Lloyd, John Uri: Gelseminine, an ether soluble alkaloid of gelsemium can be readily obtained by the use of Lloyd's reagent, a form of hydrous aluminum silicate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 625.

Vanderkleed, C. E.: Reports eight assays of gelsemium, found to vary from 0.342 to 0.658 per cent alkaloids; seven above and one below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Rippetoe, J. R.: One sample of gelsemium was found to contain 2.05 per cent of alcohol extract and 0.38 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

U. S. P. IX: One gm. of the powdered extract to represent 4 gm. of the drug. Magnesium oxide and dried starch to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 535, and Abstr. Prop. Changes, Part 3, 1914, p. 12.

Thorburn, A. D.: Fluid extract of gelsemium was found to vary from 48 to 55 per cent below standard.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 212.

Chillingsworth, F. P.: Physiological study of gelsemine and gelseminine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 315–321.

Editorial: American gelsemium takes the place of coal tar drugs in nerve pain.—Phys. Drug News, 1914, v. 9, p. 363.

Roehr, C. G.: An alkaloid of gelsemium that can be used safely in the treatment of malaria is needed.—New York M. J. 1914, v. 99, p. 1110.

GENTIANA.

U. S. P. IX: Description elaborated, including powder. Ash not exceeding 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 381, and Abstr. Prop Changes, Part 2, 1914, p. 23.

Bridel, Marc: On the presence of gentiopicrin and gentianose in the fresh root of *Gentiana purpurea* L.—J. pharm. et chim. 1914, v. 10, p. 62–66.

Asahina and Yoda: A chemical examination of the Japanese gentian root (*Gentiana scabra* Bunge var. Buergeri Maximowicz).—J. Pharm. Soc. Japan, 1914, August, p. 911.

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Bridel, Marc: On gentiacauline, a new glucoside obtained from *Gentiana acaulis* L.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 1000–1003; also J. pharm. et chim. 1914, v. 10, p. 329–335.

Baker, W. L.: Gentian powder was found to be adulterated with foreign material.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Linke, H.: The pharmacopœia should include an ash content for gentian not exceeding 5 per cent.—Apoth.-Ztg. 1914, v. 29, p. 567.

Rippetoe, J. R.: Four samples of gentian were found to contain from 33.40 to 40.88 per cent of alcohol (49 per cent) extract, and from 34.36 to 38.50 per cent of water extract, and from 3.30 to 3.45 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

Maines, E. L.: Gentian root was found to contain from 2.99 to 4.07 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Hankey, William T.: Five lots of five barrels of powdered gentian varied from 12 to 20 per cent of ash, while good gentian usually ranges about 4 per cent.—Proc. Ohio Pharm. Assoc. 1914, p. 54.

Mann, E. W.: The figures obtained for ash in nine samples of gentian varied from 3.34 to 4.85 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 15.

Jensen, H. R.: One sample of powdered gentian root was decidedly inferior, there being woody fiber present and 7 per cent of ash.—Evans' An. Notes, 1914, p. 34.

J. D. Riedel, A.-G.: Gentian contained from 2.5 to 4.8 per cent of ash, from 38.3 to 49.1 per cent of extract soluble in water, and from 42.3 to 46.9 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

Anselmino, O.: Report on a number of experiments to determine the relative specific gravity and extract content of tincture of gentian made from drug containing varying amounts of moisture.—Arb. Pharm. Inst. Univ. Berl. 1914, p. 29–31.

Doerschik, Albert N.: Acetic tincture of gentian, compound; a true bitter tonic.—Western Druggist, 1914, v. 36, p. 213–214; also Pharm. Era, 1914, v. 47, p. 311.

Carlson, van de Erve, Lewis and Orr: The action of the so-called stomachics or bitters on the hunger mechanism. In therapeutic quantities the bitters including gentian have no effect on the gastric tonus and the gastric hunger contractions or on the parallel sensation of hunger.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 209–218.

GLANDULÆ SUPRARENALES SICCÆ.

U. S. P. IX: To require that the product consist of the suprarenal glands of such animals as are used for food by man, cleaned, dried, freed from fat, and powdered, and yielding not less than 0.4 nor more than 0.6 per cent of epinephrine. Added requirement: Not

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more than 7 per cent of moisture. Method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1100, and Abstr. Prop. Changes, Part 5, 1914, p. 1.

Seidell and Fenger: Variation in the epinephrine content of suprarenal glands.—Bull. Hyg. Lab. No. 100, p. 55–66.

Haffner and Nagamachi: Report of experimental studies on the physiological activities of organ extracts.—Biochem. Ztschr. 1914, v. 62, p. 49–57.

Cazzaniga, A.: A note on the hemolytic properties of an aqueous extract of the suprarenal.—Arch. farmacol. sper. 1914, v. 17, p. 529–544.

Weiland, W.: The theory and application of organo-therapy including the use of suprarenal and other organic therapeutic preparations.—Therap. Monatsh. 1914, v. 28, p. 229–240.

Barr, James: On the functions of the thyroid, the suprarenal, and the pitiutary glands.—Practitioner, 1914, v. 92, p. 457–469; also Am. Med. 1914, v. 20, p. 260–268.

Hoskins, R. G.: The practical significance of the adrenals.—J. Am. M. Assoc. 1914, v. 62, p. 1803–1805.

See also under "Epinephrine."

GLANDULÆ THYROIDEÆ SICCÆ.

U. S. P. IX: To require that this product consist of the thyroid glands of such animals as are used as food by man, freed from connective tissue and fat, dried and powdered, and yielding not less than 0.17 nor more than 0.23 per cent of iodine in thyroid combination. Assay for iodine added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1101, and Abstr. Prop. Changes, Part 5, 1914, p. 2.

Anon.: Under the title glandulæ threoideæ Ovis, it is proposed to add to the Ph. Ndl. IV a preparation of the thyroid gland of *Ovis aries* Linn.—Pharm. Weekblad, 1914, v. 51, p. 75–77; also Rev. internat. Pharm. Brux. 1914, v. 2, p. 21, and Pharm. Post, 1914, v. 47, p. 125.

Smith and Broders: The iodine content of the thyroid gland, with especial reference to the pathologic types and a review of some experimental work.—J. Am. M. Assoc. 1914, v. 62, p. 113–117.

Seidell and Fenger: Seasonal variation in the composition of the thyroid gland.—Bull. Hyg. Lab. No. 96, p. 67–82; also Pharm. J. 1914, v. 93, p. 868–872.

Fenger, Frederic: The influence of pregnancy and castration on the iodine and phosphorus metabolism of the thyroid gland.—J. Biol. Chem. 1914, v. 17, p. 23–28.

Kendall, E. C.: The determination of iodine in connection with studies in thyroid activity.—J. Biol. Chem. 1914, v. 19, p. 251–256.

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Groll and Keulemans: The iodine content of the thyroid gland of sheep; from 0.34 to 0.54 per cent.—Pharm. Weekblad, 1914, v. 51, p. 267–274. See also Pharm. Weekblad, 1914, v. 51, p. 913–916.

Anon.: The relation between fresh and dessicated thyroid may vary from 1 to 10 to from 1 to 2.5, the latter relation being the more frequent.—Apoth.-Ztg. 1914, v. 29, p. 686.

Quant, Ernest: There is no reason why the ratio 1 to 5 for dried thyroid should not become an arbitrary standard, notwithstanding the fact that several reliable workers have challenged the correctness of this factor.—Pharm. J. 1914, v. 92, p. 421.

Groll, J. T.: Heat materially affects the solubility in water of the iodine containing constituents of thyroid glands.—Pharm. J. 1914, v. 93, p. 371.

Weiland, W.: The theory and application of organo-therapy including the use of thyroid and other organic therapeutic preparations.—Therap. Monatsh. 1914, v. 28, p. 229–240.

Blum and Grützner: Study in the physiology of the thyroid. Iodine retention and iodine combination in the organism.—Ztschr. physiol. Chem. 1914, v. 92, p. 360–382. See also v. 91, p. 392–399, 400–424, 450–464, and Apoth.-Ztg. 1914, v. 29, p. 639.

Haffner and Nagamachi: Report of experimental studies on the physiological activities of organ extracts.—Biochem. Ztschr. 1914, v. 62, p. 49–57.

Barr, James: On the functions of the thyroid, the suprarenal and the pituitary glands.—Practitioner, 1914, v. 92, p. 457–469; also Am. Med. 1914, v. 20, p. 260–268.

Bürgi and Traczewski: On the action of organ extracts on the heart. The action of thyroid with a number of tracings.—Biochem. Ztschr. 1914, v. 66, p. 417–439.

Editorial: Thyroid organotherapy in obesity.—New York M. J. 1914, v. 100, p. 776.

Crawshaw, Charles W.: Thyroid extract in nervous disorders.—Lancet, 1914, v. 186, p. 1572–1573.

For additional comments on thyroid see: Index Med.; J. Am. M. Assoc.; Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.

GLUCOSE.

U. S. P. IX: Glucose to be the product obtained by the hydrolysis of starch, consisting chiefly of dextrose and dextrines. It should be colorless, odorless, or nearly so, and have a sweet taste. Very soluble in water and sparingly soluble in alcohol. It should be free from starch, sulphur dioxide, and arsenic.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1570, and Abstr. Prop. Changes, Part 6, 1914, p. 8.

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Wagner, T. B.: The origin and the history of the production of grape sugar from starch.—J. Ind. & Eng. Chem. 1914, v. 6, p. 71; also Oil, Paint & Drug Rep. 1914, v. 85, February 2, p. 35.

Nussbaum: A review of a contribution by Willstätter and Zechmeister on the conversion of cellulose into glucose.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 248.

Jensen, H. R.: Three commercial samples of glucose contained from 34.8 to 67 per cent of dextrose; from 14.9 to 18 per cent of maltose; and from 0.4 to 35.5 per cent of ash; and from 11.5 to 16 per cent of water.—Evans's An. Notes, 1914, p. 35–36.

Morton, Harold A.: On the absorption of glucose by boneblack.—J. Am. Chem. Soc. 1914, v. 36, p. 1832–1838.

Cohen, J. B.: Fate of the glucose molecule in fermentation.—Chem. World, 1914, v. 3, p. 39–42.

Browne, C. A.: A book review of a volume on the chemistry and Technology of Glucose, by H. Wichelhaus.—J. Ind. & Eng. Chem. 1914, v. 6, p. 358.

Baumel and Cathola: Several formula for hypertonic solutions containing glucose; an abstract.—Med. Rec. 1914, v. 26, p. 488. See also Drug. Circ. 1914, v. 57, p. 678.

Scoville, W. L.: The injection into the veins of 250 to 300 cc. of a 30 per cent solution of glucose is said to sober up an intoxicated person at once.—Bull. Pharm. 1914, v. 28, p. 484.

Editorial: The intravenous injection of hypertonic glucose solution. The results obtained by Enriquez seem promising and further reports will be awaited with interest.—New York M. J. 1914, v. 99, p. 489–490.

Hunter and Hill: On the relative intolerance of the sheep to subcutaneous administration of glucose.—J. Biol. Chem. 1914, v. 17, p. 61–63.

For additional references see Index Med.; Zentralbl. exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

GLYCERINUM.

Anon.: The discovery of glycerin. A review calling attention to the first description of this substance by Scheele.—Canadian Pharm. J. 1914, v. 27, p. 348; also Pharm. Era, 1914, v. 47, p. 102.

Holde, D.: The soap, glycerin, and oil industry in the United States.—J. Ind. & Eng. Chem. 1914, v. 6, p. 45.

Oppenheimer, Max: Experimental observations on the formation of glycerin in alcoholic fermentation.—Ztschr. physiol. Chem. 1914, v. 89, p. 63–77.

Heinemann, A.: Process for the synthetic production of glycerin. English Patent 12,366, May 27, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 767.

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Anon.: Domestic production of glycerin has never been sufficient to meet the home demand, and during the last 10 years fully 350,000,000 pounds have been imported from foreign countries.—Spatula, 1914, v. 20, p. 600.

Noyes, C. R.: On account of the fact that much the largest part of the glycerin production goes to the making of nitroglycerin, much of the product on the market is not U. S. P. The two common impurities in glycerin are butyric acid and acrolein.—J. Am. Pharm. Assoc. 1914, v. 3, p. 854; also Proc. Minnesota Pharm. Assoc. 1914, p. 191.

Fernau, Albert: The Ph. Austr. VIII specific gravity requirement of 1.25 is seldom attained. A permissible variation of from 1.225 to 1.230 would be more satisfactory.—Ztschr. allgem. österr. Apoth.-Ver. 1914, v. 52, p. 253.

E'we, G. E.: The specific gravity of the nine samples of glycerin examined ranged between 1.247 and 1.249 (U. S. P. not less than 1.246).—Proc. Pennsylvania Pharm. Assoc. 1914, p. 139.

Tortelli and Ceccherelli: A method for the determination of glycerin in "technical glycerin" and in soap lyes.—Chem.-Ztg. 1914, v. 38, p. 3–5; also A new dichromate method, p. 28–31, 46–48. See also Arch. für Hygiene, 1914, v. 82, p. 514–548.

Firth, Marmaduke: An illustrated description of an apparatus for filtering glycerin.—Pharm. J. 1914, v. 93, p. 485.

Hill, C. A.: Of 402 samples of glycerin examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0 to 4 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

Feil, Joseph: A glycerin substitute was found to be a glucose sugar solution.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1648.

Baker, W. L.: One sample of glycerin contained sulphates and, with another sample, was not up to standard in color.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Richter, Ernst: A sample of glycerin did not comply with the diluted sulphuric-acid test.—Apoth.-Ztg. 1914, v. 29, p. 211.

Mann, E. W.: Of 60 samples of pharmaceutical quality of glycerin tested only 2 failed to answer our requirements for purity. These contained 15 and 20 parts per million, respectively, of arsenic.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 45.

Forman, Leroy: The determination of glycerin in tablets and confections.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1644–1645.

E'we and Vanderkleed: Alcohol determinations in the presence of glycerin.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 275.

Benians, T. H. C.: Glycerin in bromidrosis, with a note on military needs.—Lancet, 1914, v. 187, p. 1301–1302; also Chem. & Drug. 1914, v. 85, p. 789.

For additional references on glycerol see Chem. Abstr.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.; Chem. Zentralbl.

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GLYCYRRHIZA.

U. S. P. IX: Includes Russian licorice and Spanish licorice, also known as Italian, Levant, Turkish, or Arabian licorice. Russian and Spanish licorice serve to characterize the two species.—J. Am. Pharm. Assoc. 1914, v. 3, p. 382, and Abstr. Prop. Changes, Part 2, 1914, p. 24.

Xrayser II: The history of licorice. In olden times our supply appears to have come exclusively from the East, although the plant is said to be indigenous to the south of Europe.—Chem. & Drug. 1914, v. 85, p. 251.

Whiting, J. D.: The licorice trade of Syria.—Sci. Am. 1914, v. 110, p. 96; also Spatula, 1914, v. 20, p. 227–228.

Rippetoe, J. R.: Five samples of glycyrrhiza were found to contain from 15.78 to 23.36 per cent of water extract, and from 4.34 to 8.60 per cent of ash, and from 25.8 to 30.4 per cent of alkaline aqueous extract.—Am. J. Pharm. 1914, v. 86, p. 439.

Maines, E. L.: Licorice was found to contain from 2.61 to 6.61 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Mann, E. W.: The ash in four samples of powdered glycyrrhiza was in every case less than the 6 per cent limit of the Ph. Brit., the range observed being from 2.74 to 5.59.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 17.

Jensen, H. R.: Two samples of powdered licorice gave: Moisture, 9.9 and 8.3 per cent; ash, 5.6 and 6.0 per cent.—Evans's An. Notes, 1914, p. 44.

Linke, H.: Four samples of glycyrrhiza were found to contain from 4.16 to 6.28 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 568.

J. D. Riedel, A.-G.: Licorice contained from 4.4 to 6.3 per cent of ash and from 34 to 36.1 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Baker, W. L.: An extract obtained from licorice root had a musty taste.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Anon.: The examination of commercial extract of glycyrrhiza.—Pharm. Zentralh. 1914, v. 55, p. 203.

E'we, G. E.: Powdered extract of licorice contained from 25.6 to 37.8 per cent of starch.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 144.

Amos, W. S.: Fluid glycerate of licorice is probably the best form of licorice in a fluid state. Its uses may be many and its taste is much like that of ammoniated glycyrrhizin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323. See also Smith, Ernest R., p. 324.

Parkes and Major: The composition and analysis of compound licorice powder.—Analyst, 1914, v. 39, p. 160–163.

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Gibson, W. Howieson: The deficiency of sulphur in compound licorice powder may be due to an inaccuracy in analysis.—Chem. & Drug. 1914, v. 85, p. 72.

Raubenheimer, Otto: Do not keep compound licorice powder and other compound powders in the cellar, as they absorb moisture and deteriorate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 974.

GOSSYPII CORTEX.

Farwell, O. A.: A histological study of gossypii cortex with illustrations showing the cross section of the root and stem.—Merck's Rep. 1914, v. 23, p. 133–138.

Power and Browning: A chemical examination of cotton root bark. No alkaloid is contained in the bark and no evidence could be obtained of the presence of tannin.—Pharm. J. 1914, v. 93, p. 420–423.

Rippetoe, J. R.: Three samples of cotton root bark were found to contain from 5.30 to 8.05 per cent of alcohol and from 5.20 to 8.10 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 438.

GOSSYPIUM PURIFICATUM.

Farwell, O. A.: A histological study of gossypium, with illustrations showing the structural characteristics, including a longitudinal section of the seed and a cross section of the seed.—Merck's Rep. 1914, v. 23, p. 133–138.

Levine, B. S.: The structure of the cotton fiber.—Science, 1914, v. 40, p. 906.

Herzog, A.: Microscopic studies of cotton, with illustrations.—Chem.-Ztg. 1914, v. 38, p. 1089–1091, 1097–1100.

Ross, Heinz: The production of cotton in the Belgian Kongo.—Tropenpflanzer, 1914, v. 18, p. 341–343.

Anon.: The varieties of cotton grown in Turkestan.—Beihefte zum Tropenpflanzer, 1914, v. 15, p. 61–65.

Linke, H.: A sample of German absorbent cotton was found to yield but 0.02 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 541.

For additional references on cotton see Exper. Sta. Rec.; Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

GRANATUM.

U. S. P. IX.: The dried bark of the stem and root with not more than 2 per cent of wood and other foreign matter. Ash not exceeding 16 per cent. Granatum should not be kept longer than one year.—J. Am. Pharm. Assoc. 1914, v. 3, p. 383, and Abstr. Prop. Changes, Part 2, 1914, p. 25.

Helch, Hans: A method of assay should be included for pomegranate.—Pharm. Post, 1914, v. 47, p. 571.

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Dichgans, H.: A comparative study of the several official assay methods for pomegranate.—Apoth.-Ztg. 1914, v. 29, p. 416, 427.

Caesar & Loretz: The valuation of pomegranate, with a table showing the requirements included in the several pharmacopœias.—Jahres-Ber. 1914, p. 61–63. See also: p. 11–12.

GRINDELIA.

U. S. P. IX: The dried leaves of the flowering tops of *Grindelia camporum*, *Grindelia cuneifolia*, or *Grindelia squarrosa*, with not more than 10 per cent of stems and other foreign matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 383, and Abstr. Prop. Changes, Part 2, 1914, p. 25.

GUAIACOL.

Anon.: The Ph. Brit. V includes guaiacol. May be prepared synthetically or obtained by fractional distillation of beech-tar creosote.—Chem. & Drug. 1914, v. 85, p. 487.

Mayberry, George M.: The administration of guaiacol in pulmonary tuberculosis.—Brit. M. J. 1914, v. 1, p. 84.

Johnson, R. C.: Taken internally, guaiacol is better borne than creosote and it increases the appetite and promotes digestion. It relieves flatulence and is good in some cases of fermentation.—Ellingwood's Therap, 1914, v. 8, p. 89–90.

Editorial: Thirty drops of guaiacol rubbed two or three times a day into the skin of patients with high temperature will produce a powerful depressing effect on the temperature, so great and so erratic as to render it unsafe.—Ellingwood's Therap. 1914, v. 8, p. 315.

Gortner and Banta: Guaiacol is at most only slightly toxic to amphibian eggs and embryos, at saturation (0.4 per cent).—Biochem. Bull. 1914, v. 3, p. 367.

GUAIACOLIS CARBONAS.

Bernau, Albert: The melting point of a pure product ranges from 88° to 89°.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 253.

GUAIACUM.

U. S. P. IX: Guaiacum should melt at from 80° to 90°. It is readily soluble in alcohol, ether, chloroform, creosote, and in solutions of the alkalies or of hydrated chloral T. S. It is sparingly soluble in carbon disulphide or benzene.—J. Am. Pharm. Assoc. 1914, v. 3, p. 384, and Abstr. Prop. Changes, Part 2, 1914, p. 26.

Baker, W. L.: Four lots of guaiac were rejected. They were low in alcohol soluble content, high in ash content.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

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Scoville, W. L.: Guaiac resin was 67.5 to 92.8 per cent soluble in alcohol. Four out of 8 lots were about 80 per cent soluble.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Rippetoe, J. R.: Two samples of guaiac were found to contain 76.80 and 70.06 per cent of alcohol and 4 and 4.61 per cent of ash, respectively.—Am. J. Pharm. 1914, v. 86, p. 439.

McCaffrey, J. C.: Of eight samples of guaiac examined, two were below the U. S. P. requirement of 85 per cent alcohol soluble matter.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 139.

Maines, E. L.: Guaiac gum was found to contain from 3.20 to 4.95 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Jensen, H. R.: Three samples of guaiacum had: Ash, 1.5 to 3.4 per cent; alcohol insoluble matter, 15.7 to 32.3 per cent; acid value, 53.5 to 55.—Evans' An. Notes, 1914, p. 36.

Amos, W. S.: Compound gargle of guaiac may have a local use somewhere, but does not appear to have a sufficient importance to justify its inclusion in the National Formulary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

GUARANA.

U. S. P. IX: To require that guarana contain not less than 4 per cent of caffeine. Method of assay modified. Qualitative test for caffeine added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 384, 991, and Abstr. Prop. Changes, Part 4, 1914, p. 26, Part 4, p. 8.

Maines, E. L.: Guarana was found to contain from 0.89 to 1.18 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

HAMAMELIDIS CORTEX.

Editorial: In diseases of the veins, whatever their character, the free use of witch-hazel, internally and externally, will produce nothing but good results.—Ellingwood's Therap. 1914, v. 8, p. 349; also Phys. Drug. News, 1914, v. 9, p. 363.

Aqua hamamelidis.—U. S. P. IX: Process omitted. New description added. Tests for metallic impurities, limit of dissolved impurities and formaldehyde, added. Product should not contain methyl alcohol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1565–1566, and Abstr. Prop. Changes, Part 6, 1914, p. 3–4.

Arends, Georg: A satisfactory distilled extract of hamamelidis may be prepared from a mixture of witch-hazel bark and leaf macerated for 24 hours with a mixture of alcohol and water and subsequently distilled.—Apoth.-Ztg. 1914, v. 29, p. 986.

Jackson, Cook and Strickland: Eleven samples of distilled watch-hazel were examined. The alcohol content was found to vary from 7.67 to 16.6 per cent.—Rep. Rhode Island F. & D. Com. 1914, p. 16.

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Table showing some of the analytical results reported for distilled extract of witch-hazel.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	6	3	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, Lucius P.	2	2	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Congdon, Leon A.	4	3	Rep. Kansas Bd. Health, 1914, p. 100.
Lythgoe, Hermann C.	13	0	Rep. Massachusetts Bd. Health, 1913, 1914, p. 410.
Strode, Sylvanus E.	10	5	Rep. Ohio D. & F. Div. 1914, p. 120.
Woods, Chas. D.	37	0	Off. Insp. Maine Agric. Exper. Sta. 1914, No. 61, p. 91.

HAMAMELIDIS FOLIA.

Glücksmann, C.: A review of new identification reactions for fluid extract of hamamelidis.—Pharm. Praxis, 1914, v. 12, p. 425–427.

HEXAMETHYLENAMINA.

Editorial: Hexamina is the Ph. Brit. V title for hexamethylenamine.—Am. Druggist, 1914, v. 62, p. 404. See also Chem. & Drug. 1914, v. 85, p. 487, and Canadian Pharm. J. 1914, v. 48, p. 204.

Anon.: Hexamethylenetetramine is sold under the proprietary names of "Aminoform," "Cystamin," "Metramine," "Urisol," "Uritone," "Xametrin," "Vesalvine," etc.—Pharm. J. 1914, v. 93, p. 346.

Vanino and Schinner: On the combinations of hexamethylenetetramine.—Arch. Pharm. 1914, v. 252, p. 449–459.

Redman, Weith and Brock: The determination of phenol in the presence of hexamethylenetetramine and formaldehyde.—J. Ind. & Eng. Chem. 1914, v. 6, p. 205–206. See also p. 7.

Kebler, L. F.: Outline of method for the determination of hexamethylenamine in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1093.

Stüwe, W.: The determination of formaldehyde, hexamethylenetetramine and formalin pastilles.—Arch. Pharm. 1914, v. 252, p. 430–435. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 638.

Sachs, Otto: On the qualitative differences of the contents of formaldehyde in urotropin and in hexamethylenetetramine.—Therapist, 1914, v. 24, p. 88–90.

Dunning, H. A. B.: Detection and estimation of minute quantities of formaldeyhyde in presence of hexamethylenamine and of methyl alcohol in presence of ethyl alcohol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 637–641.

Gross, S.: The detection of hexamethylenetetramine in urine by the use of acetic acid and solution of corrosive mercuric chlorid.—Pharm. Zentralh. 1914, v. 55, p. 726.

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Thomann: A review of the article by Rosenthaler on the detection of hexamethylenetetramine in wine and in milk.—Schweiz, Apoth.-Ztg. 1914, v. 52, p. 7.

Schmiz, Ed.: The simulation of an albumin reaction by hexamethylenetetramine.—Deutsch. med. Wchnschr. 1914, v. 40, p. 128–129; also Pharm. Ztg. 1914, v. 59, p. 187.

Pfau, Herm.: The determination of albumin in urine in the presence of hexamethylenamine.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 162–163.

Russo, C.: a chemico-physical research on urotropin in relation to the constitution of the base.—Gaz. Chim. Ital. 1914, v. 44, p. 16–20.

Anon.: Hexamethylenamine (urotropin) and acetyl salicylic acid (aspirin) are chemically incompatible.—J. Am. M. Assoc. 1914, v. 63, p. 1971.

Mannich, C.: Incompatibility of antipyrine and hexamethylenamine.—Merck's Rep. 1914, v. 23, p. 278.

Guyot, R.: Incompatibility of urotropin in mixture with lithium benzoate and other substances.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 60–64.

Puckner, W. A.: A report on hexamethylenamine as a cure-all, with quotations from the literature used in the exploitation of Cystogen.—Rep. Council Pharm. Chem. 1914, p. 66–69.

Hanzlik, Paul J.: The liberation of formaldehyde from hexamethylenamine in pathologic fluids.—J. Am. M. Assoc. 1914, v. 62, p. 295–296. See also J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 518, and Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 1–7.

Levy and Strauss: A clinical and bacteriological study of hexamethylenamine as an urinary antiseptic.—Arch. Int. Med. 1914, v. 14, p. 730–742.

Hinman, Frank: The value of hexamethylenamine as an internal antiseptic in other fluids of the body than urine.—Arch. Int. Med. 1914, v. 13, p. 841–852; also abstract Therap. Gaz. 1914, v. 38, p. 639.

McGuigan and Hess: Hexamethylenamine as an antiseptic to prevent and to combat various infections of the serous cavities and blood as well as those of the urinary tract.—Arch. Int. Med. 1914, v. 13, p. 853–855.

Boruttau, H.: A comparison of the activity of combinations of hexamethylenetetramine.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 484–492.

Austin, F. D.: The dose of hexamethylenamine. Based on chemical tests for free formaldehyde in the fluids of the body. It is the duty of every physician to test for free formaldehyde.—New York M. J. 1914, v. 99, p. 633–636.

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Copeland, Gordon G.: Administration of urotropin in carbonic acid water.—Brit. M. J. 1914, v. 1, p. 1158.

Sachs, Otto: The application of urotropin in dermatology.—Therapist, 1914, v. 24, p. 55–57, 67–68, 75–76.

Baumen, J.: Hypodermic injections of hexamethylenetetramine in the treamtent of typhoid fever; an abstract.—Med. Rec. 1914, v. 86, p. 362.

Dyer, Isadore: The use of hexamethylenamine and of preparations containing hexamethylenamine in the treatment of pellagra.—Merck's Arch. 1914, v. 16, p. 255.

Raubenheimer, Otto: Hexamethylenamine should be administered with caution. A patient who had taken 5-grain doses every hour until five doses were taken was thrown into great excitement with impairment of vision.—J. Am. Pharm. Assoc. 1914, v. 3, p. 641.

Simon: Six cases in which hematuria followed the administration of fairly large doses of urotropin. In rabbits, hematuria could be produced only by the administration of very large doses—8 gm. per day.—Therap. Monatsh. 1914, v. 28, p. 544.

Manthner, Julius: The use of urotropin as a preservative for caviar.—Österr. Sanitatswesen, 1914, v. 26, p. 89–94.

For additional references on hexamethylenamine see Index Med.; J. Am. M. Assoc.; Chem. Abstr.; J. Chem. Soc. Lond.

HOMATROPINÆ HYDROBROMIDUM.

Jensen, H. R.: The sample of homatropine hydrobromide tested, melted at 208° to 211°.—Evans' An. Notes, 1914, p. 37.

HUMULUS.

U. S. P. IX: May include not more than 2 per cent of stems, leaves, and other foreign matter. To be dried at not exceeding 70°. Hops should be kept in air-tight containers. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 384, and Abstr. Prop. Changes, Part 2, 1914, p. 26.

Anon.: Mustard, figs, hops, and prunes are commercial products that need no pharmacopœial definition.—Lancet, 1914, v. 187, p. 907.

Anon.: The growth and cultivation of hops. A review of two recently published reports by J. Schmidt.—Nature, 1914, v. 93, p. 199–200.

Gehe & Co.: Table showing the amount of hops produced in Germany during the years 1909 to 1913, inclusive. Also table giving the amount in other countries for the years 1911 to 1913, inclusive.—Handeslbericht, 1914, p. 73–74.

Baker, W. L.: Hops were rejected, as they were inferior in both color and odor.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

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Hanausek, T. F.: The definition of hops and of lupulin.—Arch. Chem. u. Micros. 1914, v. 7, p. 44–47.

Rabak, Frank A.: Aroma of hops. A study of the volatile oil with relation to the geographical sources of hops.—J. Agric. Research, 1914, v. 2, p. 115–159; also J. Am. Pharm. Assoc. 1914, v. 3, p. 779–785.

Chapman, A. C.: The nitrogenous constituents of hops.—J. Chem. Soc. Lond. 1914, v. 105, p. 1895–1907; also Proc. Chem. Soc. 1914, v. 30, p. 196–197, and Pharm. J. 1914, v. 92, p. 878.

Editorial: Hops and their constituents. A review of an article by Power.—Pharm. J. 1914, v. 92, p. 871. See also review of article by Adler, L.: Exper. Sta. Rec. 1914, v. 30, p. 209.

Rippetoe, J. R.: Three samples of hops were found to contain from 29.40 to 34.53 per cent of alcohol (49 per cent) extract and from 8.08 to 13.01 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

Carlson, van de Erve, Lewis and Orr: The action of the so-called stomachics or bitters on the hunger mechanism. In therapeutic quantities the bitters, including humulus, have no effect on the gastric tonus and the gastric hunger contractions or on the parallel sensation of hunger.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 209–218.

HYDRARGYRI CHLORIDUM CORROSIVUM.

E'we, G. E.: Of two lots of mercuric chloride examined, one was strictly U. S. P. and assayed 99.9 per cent $HgCl_2$. The other lot contained 1.2 per cent of foreign salts.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 146.

Kaufler and Klages: Apparatus for manufacturing mercury bichloride. U. S. Patent 1,082,530, December 30, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 137.

Stüwe, W.: The volumetric determination of mercuric chloride.—Chem.-Ztg. 1914, v. 38, p. 320.

Editorial: The names that suggest mercuric chloride tablets to be harmless preparations should be discontinued, if necessary, by law.—Southern Pharm. J. 1914, v. 6, p. 287. See also Neptune, C. A.: Proc. West Virginia Pharm Assoc. 1914, p. 53.

Raubenheimer, Otto: Bichloride tablets of the German Pharmacopœia. A description of the product and reproduction of the official requirements.—J. Am. Pharm. Assoc. 1914, v. 3, p. 186–188.

Beringer, George M.: Bichloride of mercury tablets and bichloride tablet legislation. A review of the requirements included in foreign pharmacopœias.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1111–1117; also Am. J. Pharm. 1914, v. 86, p. 313–322, and Proc. New Jersey Pharm. Assoc. 1914, p. 56–64.

Remington, J. P.: In the U. S. P. IX, it is proposed to specify the size and quantites of bichloride and sodium or amonium chloride.

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There is a proposition to use coffin-shaped tablets.—Proc. West Virginia Pharm. Assoc. 1914, p. 89. See also J. Am. Pharm. Assoc. 1914, v. 3, p. 430.

Dohme, A. R. L.: The proposition to have the committee of revision undertake to lay down any one particular shape, color, or form of wrapper would be a dangerous precedent to establish.—Oil, Paint & Drug Rep. 1914, v. 85, Feb. 16, p. 32K.

The resolutions adopted by the American Medical Association regarding the form and size of tablets of mercuric chloride is reprinted.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1123; also J. Am. M. Assoc. 1914, v. 63, p. 108; Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 13.

Editorial: The solution of the bichloride problem. A suggestion to add tartar emetic to tablets of mercuric chloride.—New York M. J. 1914, v. 99, p. 1094.

Vanderkleed and E'we: Experiments indicate that to be effective an emetic must act much more promptly than tartar emetic does, as the absorption of bichloride takes place very rapidly.—Drug. Circ. 1914, v. 58, p. 465; also Proc. Pennsylvania Pharm. Assoc. 1914, p. 278.

Beal, J. H.: Proposed bichloride legislation. A review of some of the curious features proposed for enactment into law.—J. Am. Pharm. Assoc. 1914, v. 3, p. 161–164. See also p. 482–483.

Wilbert, M. I.: A discussion of the need for restricting the sale and distribution of bichloride of mercury tablets.—Am. J. Pharm. 1914, v. 86, p. 121–128.

Lackey, Richard H.: The enormous sale of bichloride tablets demands some effective legal method to make it as difficult as possible to obtain these dangerous tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 607. See also Craig, Hugh, p. 754; Bodemann, Wilhelm: N. A. R. D. Notes, 1914, v. 18, p. 118, and Drug. Circ. 1914, v. 58, p. 452.

Hancock, James E.: A review of the law regulating the sale of tablets of mercury bichloride in Maryland.—Proc. Maryland Pharm. Assoc. 1914, p. 116; also Oil, Paint & Drug Rep. 1914, v. 85, June 8, p. 11.

West, Charles A.: A review of the requirements embodied in the several bills for restricting the sale of mercury tablets.—Proc. N. W. D. A. 1914, p. 137–141.

Kebler, L. F.: Outline of method for the determination of mercuric chloride in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1087, 1091–1092.

Chapin, Robert M.: The assay of mercuric chloride tablets, a review of available methods.—Am. J. Pharm. 1914, v. 86, p. 1–6; also Merck's Rep. 1914, v. 23, p. 244–245.

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Stüwe, W.: The determination of mercury in corrosive sublimate pastilles according to the Ph. Germ. V.—Pharm. Ztg. 1914, v. 59, p. 215. See also Rupp, E.: Südd. Apoth.-Ztg. 1914, v. 54, p. 322.

Jönson, A.: The available pastilles of corrosive mercuric chloride did not always contain the amount of sublimate claimed for them.—Apoth.-Ztg. 1914, v. 29, p. 39.

Moll, F.: The danger of poisoning by the vapors of corrosive sublimate.—Ztschr. ang. Chem. 1914, v. 27, p. 559–560.

Beekman, Fenwick: A nonfatal case of mercuric chloride poisoning due to vaginal douches.—J. Am. M. Assoc. 1914, v. 62, p. 535.

Morlot and Zuber: Two cases of acute mercurial intoxication, which demonstrate and confirm the idea that the noxious effects are due to the very great causticity of mercury.—Compt. rend. Soc. Biol. 1914, v. 76, p. 896–898.

Niece, Frederic E.: The records up to date show that out of 756 known cases over 56 per cent have proven fatal, while something less than 44 per cent have recovered.—Pract. Drug. 1914, v. 32, p. 55–57.

Durrah and White: Recovery from bichloride of mercury poisoning. Report of a case.—Med. Rec. 1914, v. 86, p. 844.

Carter, Thomas A.: Mercuric chloride poisoning. A report of several cases in which a new antidote was used. The antidote used was sodium phosphite, followed by sodium acetate as a diuretic and solvent.—Am. J. Clin. Med. 1914, v. 21, p. 314–317; also Drug. Circ. 1914, v. 58, p. 284, 345.

Anon.: Questionable treatment of mercuric chloride poisoning. Comment on the use of sodium bicarbonate in the treatment of mercuric chloride poisoning.—Rep. Chem. Lab. Am. M. Assoc. 1914, v. 7, p. 39–41.

Hall, William A.: Corrosive sublimate antidote. A suggestion to utilize the principles of Mayer's reagent.—Pharm. Era, 1914, v. 47, p. 455–456; also Midl. Drug. 1914, v. 48, p. 467–470.

Lespinasse, Albert: The incompatibility between tincture of iodine and Van Swieten's solution of mercuric chloride.—Bull. sc. pharmacol. 1914, v. 21, p. 463–464.

Strickler, Margaret: Bichloride of mercury in combination with tincture of nux vomica and tincture of cinchona or tincture of cinchona compound will result in a precipitation in which much, if not all, of the mercuric chloride as such is lost.—Proc. Virginia Pharm. Assoc. 1913, 1914, p. 124–125; also Southern Pharm. J. 1914, v. 7, p. 11.

Hamilton, Herbert C.: Mercuric chloride, while highly efficient under exceptional conditions, is so readily destroyed or so lowered in efficiency under ordinary conditions that it is not a dependable disinfectant.—Therap. Gaz. 1914, v. 38, p. 313.

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Scoville, W. L.: Comparative experiments with mercuric iodide, chloride, cyanide, and benzoate indicate that the iodide is much the most powerful bactericide and is about 10 times as powerful as the chloride.—Bull. Pharm. 1914, v. 28, p. 526.

Whiting, A. D.: Alcoholic solutions of mercuric chloride are much more efficient than aqueous and markedly so when used on a dry skin.—J. Am. M. Assoc. 1914, v. 63, p. 475, also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 141.

For additional references see J. Am. M. Assoc.; Oil Paint & Drug Rep.; N. A. R. D. Notes; Chem. Abstr.; and Chem. Zentralbl.

HYDRARGYRI CHLORIDUM MITE.

Fernau, Albert: Commercial samples of mercurous chloride usually contain traces of chlorides, soluble in alcohol, and produce opalescence with silver nitrate.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Sudro, W. F.: Of 103 samples of calomel examined, only 1 sample was questionable.—Rep. North Dakota Exper. Sta. 1912, 1913, p. 165–168.

Marden and Cushman: A study of some of the methods for the determination of calomel in calomel tablets.—Am. J. Pharm. 1914, v. 86, p. 511–516. See also Kebler, L. F.: J. Am. Pharm. Assoc. 1914, v. 3, p. 1089.

Brown, L. A.: Fifteen samples of calomel and soda tablets analyzed: 11 passed and 4 classed as adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Windolph, J. Fred.: Calomel and sodium bicarbonate tablets change chemically and give visible evidence of the change.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 222.

Nitardy, F. W.: Calomel suspension. The use of acacia as a suspension medium.—J. Am. Pharm. Assoc. 1914, v. 3, p. 965–966.

Kollo, Konstantin: Ampoules of calomel in liquid paraffin may be sterilized for 15 minutes at 105°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Patein, G.: Experimental study on the action of hydrochloric acid and of alkaline chlorides on calomel in glass and in the digestive tract.—J. pharm. et chim. 1914, v. 9, p. 49–61, 109–114; also Pharm. J. 1914, v. 92, p. 363.

Crouzel, Ed.: The several toxic effects of calomel.—Répert. pharm. 1914, v. 26, p. 151–153.

Schamberg and Kolmer: Calomel has a germicidal activity equal to that of mercuric chloride.—J. Am. M. Assoc. 1914, v. 62, p. 1950.

Marrs, W. T.: Mercury in some form is the best baby medicine we possess.—Phys. Drug News, 1914, v. 9, p. 116.

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HYDRARGYRI IODIDUM RUBRUM.

Hemm, Francis: Mercuric iodide is usually mentioned in Schedule A of poison schedules, but has not been used for years as a poison.—Proc. Missouri Pharm. Assoc. 1914, p. 49.

Beckman, Ernst: On the cryoscopic constants of mercuric iodide.—Ztschr. Anorg. Chem. 1914, v. 89, p. 167–170.

Dunningham, A. C.: The system: Ethyl-water-potassium iodide-mercuric iodide.—J. Chem. Soc. Lond. 1914, v. 105, p. 368–379, 724–733, 2623–2639.

Bender, A. W.: The determination of mercuric iodide in tablets.—J. Ind. & Eng. Chem. 1914, v. 6, p. 753–754; also Chem. News, 1914, v. 110, p. 94.

E'we, G. E.: One lot of commercial ampoules of olive oil solution of red mercuric iodide contained crystals of the salt.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Stassano and Gompel: Relative bactericidal power of mercuric chloride and mercuric iodide.—Compt. rend. Soc. Biol. 1914, v. 77, p. 9–11; also Pharm. J. 1914, v. 93, p. 147, 349.

Scoville, W. L.: Comparative experiments with mercuric iodide, chloride cyanide, and benzoate indicate that the iodide is much the most powerful bactericide.—Bull. Pharm. 1914, v. 28, p. 526.

Whiting, A. D.: Watery solution of biniodide of mercury, especially when combined with potassium iodide, are much more efficient than the same strength solutions of mercuric chloride.—J. Am. M. Assoc. 1914, v. 63, p. 475; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 141.

HYDRARGYRI OXIDUM FLAVUM.

Roberts, J. G.: Sample of yellow mercuric oxide answered all the U. S. P. requirement with the exception that it yielded 0.7 per cent of residue upon ignition.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 146.

Moser and Schmid: The determination of carbon monoxide by yellow mercuric oxide.—Ztschr. anal. Chem. 1914, v. 53, p. 217–233.

Curry, Gordon L.: The U. S. P. should include a formula for an ointment of yellow mercuric oxide made from a recently precipitated and still-moist yellow oxide for ophthalmic practice.—Proc. Kentucky Pharm. Assoc. 1914, p. 59.

HYDRARGYRUM SALICYLATE.

Rupp, E.: Commercial mercuric salicylic acid is a variable compound and requires further study. A modified method for the quantitative determination of mercury is outlined.—Südd. Apoth.-Ztg. 1914, v. 54, p. 314; also Apoth.-Ztg. 1914, v. 29, p. 723.

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De Coninck, W. Oechsuer: On several reactions for mercuric salicylate.—Rev. gén. chim. 1914, v. 17, p. 125–126.

Kollo, Konstantin: Ampoules of mercuric salicylate with liquid paraffin may be sterilized for 15 minutes at 100°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

HYDRARGYRUM.

Editorial: A review of the present economic conditions in the market for mercury.—Chem. & Drug. 1914, v. 85, p. 92. See also Pharm. J. 1914, v. 93, p. 550.

Baker and Watson: The atomic weight of mercury.—J. Chem. Soc. Lond. 1914, v. 105, p. 2530–2533.

Anon.: The normal freezing point of mercury has been determined by Henning at —38.89°.—Nature, 1914, v. 93, p. 16.

Grymble, C. R.: The absorption spectra of some mercury compounds.—J. Chem. Soc. Lond. 1914, v. 105, p. 658–669.

E'we, G. E.: Of two lots of mercury examined, one was strictly U. S. P., while the other contained traces of foreign metals.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 146.

LaWall, Charles H.: A volumetric method for the estimation of mercury in some of its compounds and preparations.—J. Am. Pharm. Assoc. 1914, v. 3, p. 50.

Beckers, Wilhelm: The determination of mercury in mercurial ointment.—Pharm. Ztg. 1914, v. 59, p. 422. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 145–146, and comment by Jaenicke: Pharm. Ztg. 1914, v. 59, p. 450.

E'we, G. E.: All three lots of powdered mercury mass were slightly below the standard of 33 per cent metallic mercury, testing 31.8 to 32.3 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 146.

Xrayser II: Grey powder has from time immemorial been the familiar name of hydrargyrum cum creta, and is the British Pharmacopœia synonym.—Chem. & Drug. 1914, v. 84, p. 455.

Cohn, George: The chemistry and physiology of mercurials.—Pharm. Zentralh. 1914, v. 55, p. 91–102, 121–131, 146–153, 169–180, 217–228.

Vogel and Lee: Detection of mercury in the excretions.—J. Am. M. Assoc. 1914, v. 62, p. 532.

Klotz, A.: The quantitative determination of mercury in urine.—Ztschr. physiol. Chem. 1914, v. 92, p. 286–291.

Brandt, L.: Observations on the quantitative separation of mercury and arsenic.—Chem.-Ztg. 1914, v. 38, p. 474.

Schulte, H.: On the danger of mercurial poisoning from the handling of mercury amalgam by dentists.—Arch. Hyg. 1914, v. 83, p. 43–73.

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Grumme-Forhde: On the danger of the internal administration of iodine in connection with the use of mercury in the eye.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 448–457.

Bunch, J. L.: Some continental methods of treating syphilis. The methods of administering mercury.—Practitioner, 1914, v. 92, p. 255–260.

Mason, F. S.: The action of mercury in syphilis.—Prescriber, 1914, v. 8, p. 77–79.

Scholtz, W.: On the treatment of syphilis by means of the combined salvarsan-mercury treatment.—Deutsch. Med. Wchnschr. 1914, v. 40, p. 845–856. See also V. Zeissl: Berl. klin. Wchnschr. 1914, v. 51, p. 495–496.

Servoss, Geo. L.: Hypodermic mercurials. A list of the salts employed.—Merck's Arch. 1914, v. 16, p. 346.

Kingsbury and Bechet: The intravenous administration of mercury in syphilis.—J. Am. M. Assoc. 1914, v. 63, p. 563–564.

Raffo and Rossi: Colloidal, organic, combinations of mercury.—Kolloid Ztschr. 1914, v. 14, p. 131–136.

For additional references see Index Med.; Zentralbl. Exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

HYDRARGYRUM AMMONIATUM.

E'we, G. E.: One sample of ammoniated mercury examined assayed 80.7 per cent mercury, contained 0.4 per cent foreign salts.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 146.

Fernau, Albert: Commercial samples of ammoniated mercury shaken with water invariably give a slight precipitate with silver nitrate. This test is too stringent.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 253.

Harridas and Chondbury: The constitution of "unmeltable" white precipitate.—Ztschr. anorg. Chem. 1914, v. 86, p. 225–229.

Rupp, E.: Outline of method for determining the mercury content of white precipitate.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 314.

HYDRASTININÆ HYDROCHLORIDUM.

Newton, P. A.: Manufacture of hydrastinine. English Patent 14,120, June 18, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 503. See also Decker, H., p. 220.

Röher: Synthetic hydrastinine in the treatment of pulmonary hemorrhage.—Therap. Monatsh. 1914, v. 28, p. 505–506.

HYDRASTIS.

U. S. P. IX: The drug may not include more than 10 per cent of stems, leaves, and other foreign matter. To change "hydrastine" to

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"ether soluble alkaloids of hydrastis." Method of assay slightly modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 384, 992, and Abstr. Prop. Changes, Part 2, 1914, p. 26, Part 4, p. 9.

Stanaland, H. G.: Manufacturers and dealers frequently label hydrastis "golden seal" or "yellow root."—Drug. Circ. 1914, v. 58, p. 349.

Editorial: It is estimated that between 200,000 and 300,000 pounds of golden seal (hydrastis canadensis) are consumed annually, about one-tenth of which is exported.—Am. Druggist, 1914, v. 62, p. 405.

Welch, John T.: The growing of golden seal, or hydrastis. Observations on the care of the seed and the care of the root to be transplanted.—Pacific Pharm. 1914–15, v. 9, p. 201. See also Am. J. Pharm. 1914, v. 86, p. 525–527.

Koch, Felix J.: An illustrated description of the largest hydrastis farm in the world at Camden, Ohio.—Pharm. Post, 1914, v. 47, p. 61–62.

Anon.: The cultivation of hydrastis canadensis in Russia.—Pharm. Weekblad, 1914, v. 51, p. 55–56.

Gehe & Co.: The continued scarcity of hydrastis would indicate that the cultivation of this drug in the United States is not as extensive as might be expected.—Handelsbericht, 1914, p. 114.

Lilly, J. K.: Hydrastis continued to be adulterated to about the same extent as in previous years.—Proc. N. W. D. A. 1914, p. 263; also Oil, Paint & Drug Rep. 1914, v. 86, p. 35.

Neal, P. C.: Of 27 samples of golden seal examined, all were accepted.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

Mayrhofer, Adolf: The microchemical detection of hydrastine and of berberine in the drug.—Pharm. Post, 1914, v. 47, p. 547–551.

Maines, E. L.: Golden-seal root was found to contain from 9.93 to 14.33 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Hydrastis contained from 4.7 to 10.5 per cent of ash and from 22.9 to 27.8 per cent of extract soluble in diluted (70 per cent) extract.—Riedel's Berichte, 1914, p. 33.

Stockinger, O.: One drug sample offered as hydrastis contained berberine but no hydrastine. It appeared to be an entirely spurious sample.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 141.

Roberts, J. G.: Every lot of hydrastis examined was normal in appearance and contained more alkaloids than required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 141.

Dichgans, H.: A comparative study of the several official assay processes for hydrastis and its preparations.—Apoth.-Ztg. 1914, v. 29, p. 498, 516. See also Caesar & Loretz: Jahres-Ber. 1914, p. 23.

Caesar & Loretz: The valuation of hydrastis, with table showing the requirements included in the several pharmacopœias for this drug.—Jahres-Ber. 1914, p. 97–98.

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Table showing reported variation in alkaloidal content of hydrastis.

Reporters.	Number of samples.	Alkaloidal principles.		References.
		Minimum.	Maximum.	
Caesar & Loretz.....	10	2.25	4.21	Jahres-Ber. 1914, p. 39.
Jensen, H. R.....	15	2.60	3.60	Evans' An. Notes, 1914, p. 37.
Linke, H.....	3	2.57	3.63	Apoth.-Ztg. 1914, v. 29, p. 637–639.
Mann, E. W.....	9	1.96	3.44	Ann. Rep. Southall Bros. & Barclay, 1914, p. 15.
Vanderkleed, C. E.....	2	3.22	3.42	Proc. Pennsylvania Pharm. Assoc., 1914, p. 160.

Mann, E. W.: The compilers of the Ph. Brit. V have adopted the U. S. P. standards for liquid extract of hydrastis and have also increased the alcoholic strength of the preparations.—Am. Rep. Southall Bros. & Barclay, 1914, p. 52.

Georgević, Konstantin: The determination of hydrastine in fluid extract of hydrastis.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 95–97.

Anon.: The second supplement to the Ph. Ndl. IV requires that fluid extract of hydrastis contain 2 per cent of hydrastine.—Pharm. Post, 1914, v. 47, p. 126. See also Pharm. Weekblad, 1914, v. 51, p. 84.

U. S. P. IX: To require that 100 cc. of the fluid extract of hydrastis yield not less than 1.8 nor more than 2.2 gm. of the ether-soluble alkaloids of hydrastis.—J. Am. Pharm. Assoc. 1914, v. 3, p. 992, and Abstr. Prop. Changes, Part 4, 1914, p. 9.

Helch, Hans: Identity reactions for the constituents of hydrastis would be desirable in connection with fluid extract of hydrastis.—Pharm Post, 1914, v. 47, p. 573.

Gehe & Co.: The alkaloid content of fluid extract of hydrastis gradually decreases on keeping, due to the formation of crystals which inclose hydrastine.—Pharm. Zentralh. 1914, v. 55, p. 399.

van Itallie, E. I.: Fluid extract of hydrastis; its composition and assay. Eighteen samples were found to contain from 1.59 to 3.35 per cent of hydrastine.—Pharm. Weekblad, 1914, v. 51, p. 1522-1530.

Brown, Lucius P.: One sample of tincture of hydrastis examined was found to be illegal.—Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.

U. S. P. IX: One gm. of the powdered extract to represent 4 gm. of the drug. Magnesium oxide and dried starch to be used as the diluent.—J. Am. Pharm, Assoc. 1914, v. 3, p. 536, and Abstr. Prop. Changes, Part 3, 1914, p. 13.

Biggar, H. F.: Golden seal is a great Indian remedy for some of the ailments of the mucous membrane as well as the disorders of the digestive tract and valuable as a general tonic.—J. Am. Inst. Homœop. 1914, v. 6, p. 794–795.

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HYOSCINÆ HYDROBROMIDUM.

DuMex, A. G.: On the origin and usage of the terms "hyoscine" and "scopolamine." A criticism of the U. S. P.—Am. J. Pharm. 1914, v. 86, p. 339–349.

Editorial: The rational treatment of morphine habituation. An abstract on the administration of hyoscine.—Therap. Gaz. 1914, v. 38, p. 187–189.

HYOSCYAMINÆ HYDROBROMIDUM.

Editorial: Possibly the difficulty of preparing hyoscyamine cheaply, without the presence of hyoscine as an impurity, accounts for its decline in favor.—Lancet, 1914, v. 186, p. 49.

HYOSCYAMUS.

U. S. P. IX: The dried leaves and flowering or fruiting tops. Description elaborated and includes directions for the detection of other species of hyoscyamus. Ash not exceeding 30 per cent.— J. Am. Pharm. Assoc. 1914, v. 3, p. 385, and Abstr. Prop. Changes, Part 2, 1914, p. 27.

Anon.: An illustrated description of an unusually large plant of *Hyoscyamus niger*.—Chem. & Drug. 1914, v. 84, p. 4.

Miller, F. A.: Observations on the breeding of henbane plants to increase the alkaloids.—Lilly Sci. Bull. Ser. 1, p. 130.

Newcomb, Edwin L.: Belladonna and hyoscyamus. A report on cultivation experiments, with a number of illustrations.—Am. J. Pharm. 1914, v. 86, p. 531–542.

Kremers, Edward: The Colorado beetle or common potato bug has been observed on hyoscyamus. The poisonous alkaloids do not necessarily render plants beetle-proof.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1440.

Hooper, David: Henbane is a native of the temperate Himalayas from 8,000 to 11,000 feet. It was for a long time successfully cultivated at Hewra, Deccan, and at Dapuri, near Poona.—Montreal Pharm. J. 1914, v. 25, p. 4.

Lilly, J. K.: Henbane continues to be generally poor in appearance and low in alkaloids. Proc. N. W. D. A. 1914, p. 263; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Sayre, L. E.: *Hyoscyamus muticus*, which is sometimes added to hyoscyamus, may be distinguished almost at a glance by the presence of characteristic branching hairs.—Proc. Kansas Pharm. Assoc. 1914, p. 22.

Neal, P. C.: Of 20 samples of henbane examined, 16 were accepted and 4 were rejected.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

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Anselmino, O.: Observations on the alkaloid content of hyoscyamus leaves and the relation of the alkaloid content to ash content and moisture content.—Arb. pharm. Inst. Univ. Berl. 1914, p. 35–36.

Maines, E. L.: Henbane leaves were found to contain from 20.45 to 35.32 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Hyoscyamus contained from 18.1 to 23.8 per cent of ash and from 23.4 to 31.7 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Dichgans, H.: A comparative study of the several official assay processes for hyoscyamus and its preparations.—Apoth.-Ztg. 1914, v. 29, p. 464–487.

Caesar & Loretz: The valuation of hyoscyamus, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 85.

Fernau, Albert: A minimum content of alkaloid for hyoscyamus should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 253.

Baker, W. L.: Henbane assayed 0.15 per cent mydriatic alkaloids, which was suspiciously high.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Rusby, H. H.: A henbane that contained 0.089 per cent of alkaloid was probably a sophistication and may have consisted of stramonium.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1290.

Anselmino and Gilg: A study of commercial hyoscyamus leaves. Of the samples examined not one complied with the requirements of the Ph. Germ. V.—Arb. Pharm. Inst. Univ. Berl. 1914, p. 39–46.

Table showing reported variation in alkaloidal content of hyoscyamus.

Reporters.	Number of samples.	Alkaloidal principles.		References.
		Minimum.	Maximum.	
Caesar & Loretz	6	0.004	0.089	Jahres-Ber. 1914, p. 33.
Mann, E. W	1	.036	.....	Ann. Rep. Southall Bros. & Barclay, 1914, p. 15.
Roberts, J. G	6	.048	.064	Proc. Pennsylvania Pharm. Assoc. 1914, p. 141.
Scoville, W. L	22	−.050	+.100	J. Am. Pharm. Assoc., 1914, v. 3, p. 1288.
Vanderkleed, C. E	14	.0382	.110	Proc. Pennsylvania Pharm. Assoc. 1914, p. 100.

U. S. P. IX: One gm. of the extract to represent 4 gm. of the drug. Glucose to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 536, and Abstr. Prop. Changes, Part 3, 1914, p. 13.

U. S. P. IX: To require that 100 cc. of the fluid extract of hyoscyamus contain not less than 0.055 nor more than 0.075 gm. of the mydriatic alkaloids of hyoscyamus.—J. Am. Pharm. Assoc. 1914, v. 3, p. 993, and Abstr. Prop. Changes, Part 4, 1914, p. 10.

Digitized by Google

Thorburn, A. D.: Fluid extract of hyoscyamus was found to vary from 13 to 39 per cent below standard.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 212.

Braun, Israel: Among the group of remedies consisting of hyoscyamus, stramonium, and lobelia, the first named is the most serviceable in the treatment of bronchial asthma.—Merck's Arch. 1914, v. 16, p. 106.

Becker, Henry C.: In the treatment of epilepsy, hyoscyamus may be given in extract form in 1 to 2 grain doses.—Merck's Arch. 1914, v. 16, p. 36.

HYPOPHYSIS.

Heidelberg, Pittenger, and Vanderkleed: A pharmacodynamic study of the pituitary gland with tests of a new product; illustrated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 808–815.

Puckner, W. A.: A report on a solution of pituitary extract or an aqueous sterile solution of the posterior (infundibular) lobe of the pituitary gland of the ox.—J. Am. M. Assoc. 1914, v. 63, p. 2043.

Roth, George B.: Report of an examination of some commercial preparations made from the posterior lobe of the pituitary body.—J. Am. M. Assoc. 1914, v. 63, p. 476–479; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 160–168.

Bouin and Ancel: A process for the isolation of the active substance of the posterior lobe of the hypophysis.—Compt. rend. Soc. biol. 1914, v. 76, p. 62–64. See also: p. 110–112.

Roth, G. B.: Pituitary standardization. A comparison of the physiological activity of some commercial pituitary preparations with a number of tracings.—Bull Hyg. Lab. No. 100, p. 5–42.

Crawford and Ostenberg: The pressor compounds of the pituitary gland.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 126. See also: Am. J. Pharm. 1914, v. 86, p. 291–306.

Niculescu, Petre: The relation of the physiological actions of hypophysis extract, adrenin, ergot preparations, and beta-imidazolylethylamine.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 1–11. See also Boruttau, H., p. 11–12.

Guggenheim, M.: A contribution to our knowledge of the active principle of the hypophysis. A report of experimental work illustrated by tracings.—Biochem. Ztschr. 1914, v. 65, p. 189–218. See also Fühner, H., Berl. klin. Wchnschr. 1914, v. 51, p. 248–250.

Roth, George B.: A new standard for the determination of the strength of pituitary extracts. The use of beta-imidazolyl-ethylamine hydrochloride in 1 to 20,000,000 solution.—J. Pharmacol. & Exper. Path. 1914, v. 5, p. 559–570.

Parisot and Mathieu: A study of the comparative effects of the extract of the posterior lobe of the hypophysis.—Compt. rend. Soc. biol. 1914, v. 76, p. 222–224.

Digitized by Google

Nichols, C. L.: Pituitary extract. Physiological action, therapeutics, and contraindications.—Therap. Gas. 1914, v. 38, p. 463–464. For discussion see p. 464–470.

Frölich and Pick: An experimental study on the action of preparations of the hypophysis, with tracings.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 92–118.

Lieb, C. C.: The effect of the pituitary on the isolated human uterus, a preliminary communication.—Proc. Soc. Exper. Biol. 1914, v. 12, p. 8–10.

Harrison, Virginius: Use and abuse of pituitary extract in labor.—J. Am. M. Assoc. 1914, v. 63, p. 1977. See also Rongy, A. J.: New York M. J. 1914, v. 99, p. 878–880, and Brodhead, George L., p. 1289–1290.

Hendlay, P. A.: Pituitrin in labor. A record of 60 cases, with notes on its administration.—Brit. M. J. 1914, v. 1, p. 906–907. See also p. 1098, and comments by Sanders, p. 1098.

Webster, Herbert T.: Aftermath of pituitrin. In the few cases in which it has been employed the recovery from confinement was slow and unsatisfactory.—Eclectic M. J. 1914, v. 74, p. 347–348.

Parisot and Mathieu: On the action of extracts of the posterior lobe of the hypophysis on organisms having smooth muscular fibers.—Compt. rend. Soc. biol. 1914, v. 76, p. 225–226.

Zueblin, Ernest: The action of pituitrin upon acute heart failure and incompensate heart lesions.—Boston M. & S. J. 1914, v. 171, p. 962–970.

Nice, Rock, and Courtright: The influence of pituitrin on respiration.—Am. J. Physiol. 1914, v. 35, p. 194–198.

Hallion, L.: On the hypotensive action of the extract of the posterior lobe of the hypophysis on pulmonary circulation.—Compt. rend. Soc. biol. 1914, v. 76, p. 581–583. See also Howell, A. Alexander: Am. J. M. Sc. 1914, v. 148, p. 563–567.

Crookshank, F. G.: A note on the value of pituitary gland substances in some cases of asthma.—Lancet, 1914, v. 186, p. 747–748.

Porritt, Norman: Pituitrin in post-operative intestinal stasis; with notes on two cases.—Brit. M. J. 1914, v. 1, p. 1118.

Garnier and Schulman: The influence of extract of the posterior lobe of the hypophysis on urinary secretion.—Compt. rend. Soc. biol. 1914, v. 77, p. 335–337.

Hill and Simpson: The effect of the intramuscular injection of pituitary extract on the secretion of milk in the human subject.—Am. J. Physiol. 1914, v. 35, p. 361–366. See also Proc. Soc. Exp. Biol. 1914, v. 11, p. 82–85.

Ellingwood, Finley: The field of action of the pituitary gland is an astonishingly wide one.—Nat. Eclect. M. Assoc. Quart. 1914, v. 5, p. 206.

Digitized by Google

Winn, J. F.: Pituitary extract is a dangerous remedy. A case of rupture of the uterus from this agent was followed by immediate death.—J. Am. M. Assoc. 1914, v. 63, p. 1978.

For additional references see: Index Med.; Zentralbl. exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

INFUSA.

U. S. P. IX: Infusions should be freshly prepared from the drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Curry, Gordon L.: The official infusions are extemporaneous and should be made as required.—Proc. Kentucky Pharm. Assoc. 1914. v. 57.

Jørgensen, Chr. F.: Decoctions and infusions; a comparative study of the results obtained by the methods employed in the Danish and German Pharmacopœias.—Arch. Pharm. og Chem. Copenhagen, 1914, v. 21, p. 225–232.

IODOFORMUM.

Fernau, Albert: Water shaken with iodoform should not alone be clear, but colorless. The yellow color indicates contamination by picric acid.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Richter, Ernst: A 10 per cent iodoform gauze was found to contain but 6.3 per cent of iodoform.—Apoth.-Ztg. 1914, v. 29, p. 211.

Brackett, E. G.: The use of iodoform oil in joints; with case reports.—Boston M. & S. J. 1914, v. 170, p. 873–878.

Schülte: The intravenous injection of a solution of iodoform in ether, in the treatment of tuberculosis.—Münch. med. Wchnschr. 1914, v. 61, p. 27.

Courtney, B. J.: The treatment of leprosy by intravenous injections of iodoform.—Lancet, 1914, v. 189, p. 1806–1808.

IODUM.

Raubenheimer, Otto: The centenary of the discovery of iodine.—Midl. Drug. 1914, v. 48, p. 6–10.

Sterkers, E.: The manufacture and the uses of iodine and iodides.—Rev. chim. Industrielle, 1914, v. 25, p. 177–188.

Laurent, I.: Industrial extraction of iodine from marine algæ. French Patent 467,768, April 4, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 920.

E'we, G. E.: Fifteen lots of iodine examined were all above the 99 per cent required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 142.

Digitized by Google

Lorimand, Ch.: The determination of iodine in official preparations.—Ann. Falsif. 1914, v. 7, p. 432–441.

Leclère, M.: Several causes of error in determining iodine.—Répert. pharm. 1914, v. 26, p. 260–261.

François and Lormand: The determination of iodine in pills of ferrous iodide.—Ann. Falsif. 1914, v. 7, p. 203–209.

Cole, Harriet I.: The estimation of iodine and bromine in haloid salts by means of telluric acid.—Am. J. Sci. 1914, v. 188, p. 265–272.

Lormand, Ch.: A proposed method for the determination of iodine in iodotannin preparations.—Bull. sc. pharmacol. 1914, v. 21, p. 195–197. See also Debreuil, Ch., p. 409–411.

Brown, Lucius P.: Considerable difficulty is still experienced with tincture of iodine. This comparatively simple product is found to vary from the standard both in its iodine content and its potassium iodide content. The great variations found indicate either gross carelessness, or a "don't care" attitude of mind.—Bull. Tennessee F. & D. Dept. 1914, p. 8.

Lythgoe, Hermann C.: Tincture of iodine has been examined for a longer period than any other drug, and since 1904 the ratio of adulteration has been brought down from 90 to 15 per cent.—Bull. Massachusetts Bd. Health, 1914, v. 9, p. 269.

Brown, Linwood, A.: The assay of tincture of iodine includes the determination of alcohol, the determination of free acid and the determination of potassium iodide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 644–645.

Windolph, J. Fred.: Tincture of iodine does not lose under ordinary circumstances as much iodine as it loses alcohol, and hence with age it usually shows an increase in potency not always desirable.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 221.

U. S. P. IX: In making tincture of iodine, 50 gm. of potassium iodide is dissolved in 50 cc. of distilled water in a bottle, 70 gm. of iodine is then dissolved in this solution by agitation and enough alcohol added to make 1000 cc. No water was used in the former process.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1577, and Abstr. Prop. Changes, Part 6, 1914, p. 15.

Richter, Ernst: Methods for making tincture of iodine by circulatory solution.—Apoth.-Ztg. 1914, v. 29, p. 686. See also Fernau, Albert: Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 264.

Kaiser, W. F.: An improved formula for tincture of iodine.—Northwestern Druggist, 1914, v. 15, January, p. 26–27. See also Kuever, R. A.: March, p. 26; Williams, Ed. E.: Proc. Wisconsin Pharm. Assoc. 1914, p. 22; and Reum, Arthur: Pacific Pharm. 1914, v. 8, p. 62–63.

Digitized by Google

Droste, R.: Observations on the decomposition of tincture of iodine, the determination of the decomposition and its prevention.—Pharm. Zentralh. 1914, v. 55, p. 503–510, 525–532. See also van Itallie, E. I.: Pharm. Weekblad, 1914, v. 51, p. 1184–1185.

Roques, Ferdinand: The regeneration of a deteriorated tincture of iodine by the addition of iodic acid.—Apoth.-Ztg. 1914, v. 29, p. 310.

Thorburn, R. D.: Compound solution of iodine was found to be 47 per cent below standard.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 212.

Pratt, Walter R.: The composition of tinctura iodi decolorata, B. P. C.—Pharm. J. 1914, v. 92, p. 130–131. For discussion see: p. 161; also Year-Book of Pharmacy, 1914, p. 388–392; Merck's Rep. 1914, v. 23, p. 221–222; and Farm. Españ. 1914, v. 46, p. 824.

Ceppellini, Italo: Benzol as a substitute for ethyl alcohol in the preparation of tincture of iodine.—Boll. chim.-farm. 1914, v. 53, p. 660.

Editorial: The danger of using methylated spirit in the preparation of iodine solution.—Chem. & Drug. 1914, v. 84, p. 938.

Lespinasse, Albert: The incompatibility between tincture of iodine and Van Swieten's solution of mercuric chloride.—Bull. sc. pharmacol. 1914, v. 21, p. 463–464.

Table showing some of the analytical results reported for tincture of iodine.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	28	20	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, L. A.	79	54	Proc. Kentucky Pharm. Assoc. 1914, p. 117.
Brown, Lucius P.	5	2	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Congdon, Leon A.	11	11	Rep. Kansas Bd. Health 1914, 1914, p. 100.
Frary, Guy G.	84	35	Rep. South Dakota F. & D. Com., 1914, p. 224, 260, 337.
Lythgoe, Hermann C.	267	41	Rep. Massachusetts Bd. Health, 1913, p. 4–11.
Marquier, Adolph F.	38	18	Proc. New Jersey Pharm. Assoc. 1914, p. 110.
Newcomb, George D.	6	2	Proc. Iowa Pharm. Assoc. 1914, p. 28.
News Item.	21	14	J. Am. M. Assoc. 1914, v. 62, p. 859.
Stadtmueller, Frank.	39	4	Rep. Connecticut D. & F. Com. 1914, p. 15.
Strode, Sylvanus E.	14	11	Rep. Ohio D. & F. Div., 1914, p. 119.
Summers, A. C.	60	30	Rep. South Carolina Com. Agric. Com. & Ind. 1914, v. 10, p. 208.
Todd, A. R.	132	79	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R.	181	97	Bull. Michigan D. & F. Dept. 1914, January-February, p. 17, March-April, p. 19, May-June, p. 27, July-August, p. 26, September-October, p. 16, November-December, p. 22.
Wiedemann, H. E.	79	55	Rep. Missouri F. & D. Com. 1914, p. 19–23.

Scoville, W. L.: A solution of iodine in benzol is stated to be the best single disinfectant for the skin, because it penetrates deeper than other effective disinfectants.—Bull. Pharm. 1914, v. 28, p. 526.

Adler and Czapski: Experimental study on the chemistry of iodine action.—Biochem. Ztschr. 1914, v. 65, p. 117–128.

Digitized by Google

Johnson, Alfred: Free iodine as a therapeutic agent.—Prescriber, 1914, v. 8, p. 117–122.

Paris Correspondent: Tincture of iodine and the army.—Lancet, 1914, v. 187, p. 1115.

Herzog, Wilhelm: The use of tincture of iodine for the rapid disinfection of the skin.—Münch. med. Wchnschr. 1914, v. 61, p. 2319–2320.

Hobday, Frederick: The great value of iodine as an antiseptic for the skin in the surgery of animals.—Vet. J. 1914, v. 20, p. 5–6.

Nicoll, Jas. H.: Iodine in skin wounds.—Brit. M. J. 1914, v. 2, p. 814–815.

Michaud, Henri: An illustrated description of an ampoule tampon of tincture of iodine for antiseptic dressings.—Compt. rend. Soc. biol. 1914, v. 77, p. 556–557.

Schumacher, J.: Observations on disinfection with nascent tincture of iodine, and on stable, solid substitutes.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1125–1126.

Wildey, A. Gascoigne: Iodine as an antiseptic in joint injuries.—Brit. M. J. 1914, v. 2, p. 1056.

Laird, John: Notes on the use of iodine and iodides.—Prescriber, 1914, v. 8, p. 151–153.

Waller, H. Ewan: On the value of iodine taken internally.—Prescriber, 1914, v. 8, p. 153–155.

Dally, J. F. Halls: Observations on the intensive nascent iodine treatment of tuberculosis.—Practitioner, 1914, v. 92, p. 804–811. See also Reeve, Edward G.: p. 812–816.

Hirsch, E. F.: An experimental study of the influence of iodine and iodides on the absorption of granulation tissue and fat-free tubercle bacilli.—J. Infect. Dis. 1914, v. 15, p. 487–500.

Wells, De Witt and Cooper: The occurrence of iodine in the chemotherapy of tuberculosis.—Ztschr. Chemotherap. 1914, v. 2, p. 112–124.

Macht, D. I.: The action of potassium and sodium iodides and of the iodine ion on the heart and blood vessels.—J. H. Hosp. Bull. 1914, v. 25, p. 278–284.

Lehndorff, Arno: An experimental study to determine the influence of iodine on the circulation.—Arch. exper. Path. u. Pharmakol. 1914, v. 76, p. 224–236.

Schwalbe, J.: The influence of iodine therapy on arteriosclerosis.—Deutsch. med. Wchnschr. 1914, v. 40, p. 749–753, 801–804.

Kennedy, E. G.: A case of lupus vulgaris cured by tincture of iodine.—Brit. M. J. 1914, v. 1, p. 709.

Kafemann, R.: Progress in iodine therapy. A review.—Berl. klin. Wchnschr. 1914, v. 8, p. 977–978.

Editorial: A review of iodine therapy. External application and uses of iodine.—Prescriber, 1914, v. 8, p. 109–116, 141–150.

Digitized by Google

Gray, Robert H.: Iodine to deodorize stinking feet.—Am. J. Clin. Med. 1914, v. 21, p. 90.

Grumme-Fohrde: On the danger of the internal administration of iodine in connection with the use of mercury in the eye.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 448–457.

Stone, I. S.: The application of iodine and alcohol to the vagina and uterine mucosa have been productive of results which appear to be ideal.—J. Am. M. Assoc. 1914, v. 62, p. 2048.

Perret: A case of acute iodism from the injection into the vagina of 11 to 12 grammes of tincture of iodine in 2 liters of water.—Bull. Soc. Scientif. et Med. l'ouest, 1914, v. 23, p. 38–40.

For additional references on iodine see Index Med.; J. Am. M. Assoc.; Chem. Abstr.; Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.; Chem. Zentralbl.; J. Chem. Soc. Lond.

IPECACUANHA.

U. S. P. IX: Ipecac may contain not more than 10 per cent of stems. Rio ipecac and Cartagena ipecac described separately. Ash not less than 1.8 per cent and not more than 4.5 per cent. To require that ipecac contain not less than 2 per cent of ipecac alkaloids.—J. Am. Pharm. Assoc. 1914, v. 3, p. 386, 993, and Abstr. Prop. Changes, Part 2, 1914, p. 27, Part 4, p. 10.

Editorial: The U. S. P. should spell Cartagena properly; there is no "h" in the American place.—Chem. & Drug. 1914, v. 84, p. 566.

Mann, E. W.: The Ph. Brit. V requires ipecacuanha to contain not less than 2 per cent of alkaloids.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 16.

Delaye, L.: Powdered ipecac and the compliance of the commercial article with the requirements of the Ph. Belg.—Rev. Internat. Pharm. Brux. 1914, v. 2, p. 177–178.

Linke, H.: The pharmacopœia should include an ash content for ipecac not exceeding 4.5 per cent.—Apoth.-Ztg. 1914, v. 29, p. 568.

Hooper, David: The first attempts to acclimatize ipecacuanha in India were undertaken in northern India by Dr. Anderson. The Indian-grown root has been found to be medicinally active and to contain emetine equal to that found in the commercial article.—Montreal Pharm. J. 1914, v. 25, p. 5. See also Editorial: Chem. & Drug. 1914, v. 84, p. 565–566.

Gehe & Co.: A review of the economic conditions of the market in ipecac.—Handelsbericht, 1914, p. 110.

Carr and Pyman: The alkaloids of ipecacuanha, with a review of previous work.—J. Chem. Soc. Lond. 1914, v. 105, p. 1591–1638; also Proc. Chem. Soc. 1914, v. 30, p. 157.

Reutter, L.: A review of some of the recent literature relating to the alkaloids of ipecac.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 730–732.

Digitized by Google

Windaus and Hermanns: Examination of emetine. Its chemical composition and structural characteristics.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 1470–1472.

Anon.: Genuine ipecac contains five alkaloids, of which emetine and cephaeline predominate, the other three being psychotrine, ipecamine, and hydroipecamine.—Südd. Apoth.-Ztg. 1914, v. 54, p. 358.

Wellcome, Carr, and Pyman: Manufacture of emetine. English Patent 14,677, June 25, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 102. See also p. 219 and p. 43.

Hesse, O.: A contribution to our knowledge of the alkaloids of true ipecac. The consumption and characteristics of emetine, cephaeline, psychotrine, ipecamine, and hydroipecamine, the per cent content of alkaloids, and the therapeutic action of ipecac.—Ann. Chem. 1914, v. 405, p. 1–57; also Apoth.-Ztg. 1914, v. 29, p. 430, and Pharm. J. 1914, v. 93, p. 425.

Dejussieu, Michel: The procedure for the preparation of emetine hydrochloride proposed by Fromment and a comparative presentation of the method of assay for ipecac included in the codex for 1908.—Bull. pharm. sud-est, 1914, v. 19, p. 137–139; also Répert. pharm. 1914, v. 26, p. 194–196.

Bridel, Marc: Recent work on the alkaloids of ipecac; a review.—J. pharm. et chim. 1914, v. 10, p. 273–285.

Dobbie and Fox: The relation between the absorption spectra and the constitution of certain isoquinoline alkaloids and of the alkaloids of ipecacuanha.—J. Chem. Soc. Lond. 1914, v. 105, p. 1639–1642.

Anon.: A description of alcresta ipecac, a precipitation product made by treating an extract of ipecac with Lloyd's reagent.—D.-A. Apoth.-Ztg. 1914, v. 35, p. 51.

Rippetoe, J. R.: Eight samples of ipecac contained from 3.40 to 4.63 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 444.

Maines, E. L.: Ipecac was found to contain from 3.28 to 8.05 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Ipecac contained from 3.1 to 5.5 per cent of ash, from 25.6 to 36.6 per cent of extract soluble in water, and from 20.4 to 25.7 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

Caesar & Loretz: The valuation of ipecac root, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 94–96.

van der Wielen and Reens: An assay of the sample of ipecacuanha by the methods official in 10 pharmacopœias gave a variation of from 1.67 per cent by the U. S. P. to 2.15 per cent by the Ph. Austr.—Pharm. J. 1914, v. 92, p. 541.

Dichgans, H.: A comparison of the several official assay methods shows them to give results varying from 1.927 Ph. Japon., to 2.6,

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Ph. Austr. The direct titration method does not give as constant result as does residual titration.—Apoth.-Ztg. 1914, v. 29, p. 381–382.

Caesar & Loretz: A review of some critical comments on the article by Dichgans on the comparative value of several assay methods for ipecac.—Jahres-Ber. 1914, p. 25–26. See also Dichgans, H.: Apoth.-Ztg. 1914, v. 29, p. 358, 368, 378, 391.

E'we and Vanderkleed: Effect of heat on ipecac alkaloids. If allowed to remain on the steam bath after the ethereal layer has evaporated, darkening and disintegration of the alkaloids results.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 277.

Otabe, S.: The Ph. Japon. III method for the assay of ipecac is not so satisfactory as that of the Ph. Germ. V.—J. Pharm. Soc. Japan, 1914, June, p. 623. See also Asahina, Y., p. 627.

Neal, P. C.: Of 26 samples of ipecac examined, 23 were accepted and 3 were rejected.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

Table showing reported variation in alkaloidal content of ipecac.

Reporters.	Number of samples.	Alkaloidal principles.		References.
		Minimum.	Maximum.	
Hankey, William T...	8	1.24	2.21	Proc. Ohio Pharm. Assoc., 1914, p. 49.
Jensen, H. R.....	18	1.63	2.35	Evans' An. Notes, 1914, p. 38.
Mann, E. W.....	20	1.60	2.56	Ann. Rep. Southall Bros. & Barclay, 1914, p. 16.
Patch, E. L.....	3	1.837	2.40	J. Am. Pharm. Assoc., 1914, v. 3, p. 1288.
Roberts, J. G.....	9	.823	2.50	Proc. Pennsylvania Pharm. Assoc., 1914, p. 142.
Scoville, W. L.....	1	1.58	.....	J. Am. Pharm. Assoc., 1914, v. 3, p. 1288.
Vanderkleed, C. E.....	23	.950	2.52	Proc. Pennsylvania Pharm. Assoc., 1914, p. 160.

U. S. P. IX: To require that 100 cc. of the fluid extract of ipecac yield not less than 1.8 nor more than 2.2 gm. of the ether-soluble alkaloids of ipecac.—J. Am. Pharm. Assoc. 1914, v. 3, p. 993, and Abstr. Prop. Changes, Part 4, 1914, p. 10.

Editorial: The discovery of the value of emetine and the use of emetine as a specific for amebic dysentery.—Am. Med. 1914, v. 20, p. 3.

Miller, Joseph L.: The clinical value of expectorants. Ammonium carbonate and ammonium chloride and the emetic group of expectorants, as apomorphine and ipecac when given in sufficiently large doses to animals increase bronchial secretion.—Am. J. M. Sc. 1914, v. 148, p. 475.

Yeomans, Frank C.: Amebic dysentery, with special reference to its treatment with emetine.—New York M. J. 1914, v. 99, p. 327–331.

Low, George C.: Recent researches on emetine and its value as a therapeutic agent in amebiasis and other diseases.—Proc. Roy. Soc. Med. Therap. & Pharmacol. Sec. 1914, v. 7, p. 41–49.

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Mayer, Martin: Contribution on the emetine treatment of dysentery.—Münch. med. Wchnschr. 1914, v. 61, p. 241–242. See also p. 1733.

Holt, John M.: The use of emetine in amebic dysentery.—Public Health Rep. 1914, v. 29, p. 2005–2007.

Dudley, F. A.: Emetine hydrochloride and aspiration in the treatment of amebic dysentery and liver abscess.—Therap. Gaz. 1914, v. 38, p. 390–392.

Sandwith, F. M.: The alkaloids of ipecac and the use of emetine in the treatment of dysentery.—Lancet, 1914, v. 187, p. 732. See also Chepmell, I. D., p. 767.

Raeburn, James A.: Subcutaneous injections of emetine in pulmonary tuberculosis.—Brit. M. J. 1914, v. 1, p. 703–704.

Philipps, Llewellyn: The sufficiency of emetine to bring about a radical cure in amebiasis.—Brit. M. J. 1914, v. 2, p. 1061.

Spehl and Colard: A case of poisoning by emetine hydrochloride administered in the treatment of amebic dysentery.—Drug. Circ. 1914, v. 58, p. 527.

Collins, H. S.: Unusual effects of ipecac. Acute inflammation of the eyes caused by crude ipecac alkaloids.—Pharm. J. 1914, v. 92, p. 316.

Cripps, Douglas H.: Two cases in which after grinding quite small quantities of ipecac bleeding of the nose ensued.—Pharm. J. 1914, v. 92, p. 218.

For additional references see: Index Med.; Zentralbl. Exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

JALAPA.

U. S. P. IX: Description elaborated. Ash not exceeding 6.5 per cent. In the assay of jalap, the drug is to be extracted with alcohol. Percolate washed with chloroform after the addition of water. The chloroform solution to be evaported on a water bath.—J. Am. Pharm. Assoc. 1914, v. 3, p. 386, 994, and Abstr. Prop. Changes, Part 2, 1914, p. 28, Part 4, p. 11.

Fernau, Albert: The Ph. Austr. assay method for jalap should be made to read more definitely.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 263.

Hooper, David: Experiments made in the cultivation of jalap tubers near Ootacamund, Nilgiri Hills, prior to 1870.—Montreal Pharm. J. 1914, v. 25, p. 5.

Gehe & Co.: The supply of jalap far exceeds the demand, and prices are correspondingly low.—Handelsbericht, 1914, p. 121.

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Caesar & Loretz: The valuation of jalap, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 118–119.

Rippetoe, J. R.: Seven samples of jalap contained from 0.62 to 1.77 per cent of ash; average 1.29 per cent.—Am. J. Pharm. 1914, v. 86, p. 444.

J. D. Riedel, A.-G.: Jalap contained from 3.2 to 4.8 per cent of ash and from 16.9 to 21.5 per cent of extract soluble in alcohol.—Riedel's Berichte, 1914, p. 33.

Neal, P. C.: Of 31 samples of jalap examined 25 were accepted and 6 were rejected.—Proc. Maryland Pharm. Assoc. 1914, p. 95.

Table showing reported variation in resin content of jalap.

Reporters.	Number of samples.	Resin content.		References.
		Minimum.	Maximum.	
Caesar & Loretz.....	12	8.30	11.72	Jahres-Ber. 1914, p. 40.
Jensen, H. R.....	9	8.20	10.60	Evans' An. Notes, 1914, p. 39.
Mann, E. W.....	4	5.80	14.00	Ann. Rep. Southall Bros. & Barclay, 1914, p. 16.
Patch, E. L.....	5	8.57	9.67	J. Am. Pharm. Assoc. 1914, v. 3, p. 1288.
Roberts, J. G.....	11	6.30	9.97	Proc. Pennsylvania Pharm. Assoc. 1914, p. 143.
Vanderkleed, C. E.....	13	5.07	9.24	Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

KAOLINUM.

Keenan, Thomas J.: The interesting history of kaolin and its uses.—Am. Druggist, 1914, v. 62, p. 55–57; also Pharm. Era, 1914, v. 47, p. 70–71.

E'we, G. E.: The seven samples of kaolin examined were all free from carbonates; one of the samples produced a very much thinner cataplasm than usual.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 143.

Rohland, Paul: The behavior of clays and kaolins toward hydroxylions.—Biochem. Ztschr. 1914, v. 58, p. 202–204.

Harris, J. E.: Some adsorption phenomena in soils and kaolin. The relation of the adsorption problem to the nature of the soil.—J. Phys. Chem. 1914, v. 18, p. 355–372.

Rohland, Paul: The adsorption property of kaolin.—Kolloid Ztschr. 1914, v. 14, p. 193–195.

Curry, Gordon L.: Cataplasma kaolini is unsatisfactory as made in kilo lots; difficult to stir without special machinery; considered unpractical.—Proc. Kentucky Pharm. Assoc. 1914, p. 56.

Llewellyn, H. D.: The addition of 100 gm. of glycerin to the present formula for cataplasma koalini would make a more desirable preparation for either hot or cold use.—Proc. Missouri Pharm. Assoc. 1914, p. 141.

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Anon.: Cataplasma kaolini is a preparation of glycerin with kaolin as an incipient rather than a preparation of kaolin.—Chem. & Drug. Australas. 1914, v. 29, p. 243.

Richter, Ernst: Method of making sterilized bolus alba for use as a medicine.—Apoth.-Ztg. 1914, v. 29, p. 978.

Stumpf, Julius: The use of bolus alba in diarrhea, dysentery, and Asiatic cholera.—Münch. med. Wchnschr. 1914, v. 61, p. 2050–2052. See also Pick, Alois: Pharm. Post, 1914, v. 47, p. 793, and p. 793–794.

v. Wilucki: The use of bolus alba in the treatment of paratyphoid.—Münch. med. Wchnschr. 1914, v. 61, p. 2356.

Fleissig: A review of some of the recent literature relating to the treatment of cholera by means of bolus alba.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 582–583.

KIESELGUHR.

U. S. P. IX: Purified kieselguhr is to consist of the frustules and fragments of diatoms, purified by boiling with diluted hydrochloric acid. It should not contain more than 10 per cent of hygroscopic moisture.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1577, and Abstr. Prop. Changes, Part 6, 1914, p. 15.

KINO.

U. S. P. IX: The spontaneously dried juice, varying in color from a dark reddish brown to a red black. Moisture content not more than 12 per cent. Ash not exceeding 3 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 387, and Abstr. Prop. Changes, Part 2, 1914, p. 28.

Mann, E. W.: The Ph. Brit. V requires the drug to be soluble in boiling water to the extent of 75 per cent, as against the former requirement of 80 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 17.

E'we, G. E.: One lot of kino assayed 69.6 per cent of alcohol soluble matter and 3.85 per cent of ether soluble matter.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 144.

Rippetoe, J. R.: One sample of kino was found to contain 62.43 per cent of alcohol extract, 67.96 per cent of water extract, and 2.83 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

KRAMERIA.

U. S. P. IX: The drug may include not more than 5 per cent of stems. Aqueous extract not less than 9 per cent. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 387, and Abstr. Prop. Changes, Part 2, 1914, p. 29.

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Helch, Hans: Identity reaction for the constituents of krameria would be desirable in connection with the fluid extract of krameria.—Pharm. Post, 1914, v. 47, p. 573.

Rippetoe, J. R.: One sample of krameria was found to contain 28.54 per cent of alcohol (49 per cent) extract, and 1.35 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

Linke, H.: Two samples of krameria gave 3.28 and 7.36 per cent of ash, respectively.—Apoth.-Ztg. 1914, v. 29, p. 568.

Smith, Ernest R.: The proposed fluid glycerate of krameria has every appearance of being a good preparation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 324.

LACTUCARIUM.

U. S. P. IX: Boiling water extract of lactucarium should be clear while hot, but on cooling it should be turbid free from starch. Ash not exceeding 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 387, and Abstr. Prop. Changes, Part 2, 1914, p. 29.

van Itallie, I.: The collection of lactucarium.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 954–955; also Répert. pharm. 1914, v. 26, p. 1.

Rippetoe, J. R.: One sample of lactucarium was found to contain 44.21 per cent of alcohol extract, 27.82 per cent of water extract, and 0.71 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

Roberts, J. G.: One lot of lactucarium was considered unsatisfactory on account of the presence of a lot of moldy pieces.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 144.

Sayre, L. E.: Sirup of lactucarium. The modified formula for sirup of lactucarium, suggested by Beringer, is indorsed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 237–239.

LAPPA.

Maines, E. L.: Burdock root was found to contain from 4.20 to 10.45 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Rippetoe, J. R.: One sample of lappa was found to contain 24.90 per cent of alcohol (49 per cent) extract, and 6.22 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

LEPTANDRA.

U. S. P. IX.: Leptandra may include not more than 5 per cent of stems and other foreign matter. Description somewhat elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 388, and Abstr. Prop. Changes, 1914, Part 2, p. 30.

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Editorial: Leptandra acts on the liver with very little action on the bowels.—Phys. Drug. News, 1914, v. 9, p. 363.

Jones, George F.: Leptandra is a valuable auxiliary in the treatment of jaundice.—Ellingwood's Therap. 1914, v. 8, p. 411–412.

LIMONIS CORTEX.

U. S. P. IX: The outer rind of the fresh ripe fruit.—J. Am. Pharm. Assoc. 1914, v. 3, p. 388, and Abstr. Prop. Changes, Part 2, 1914, p. 30.

Roure-Bertrand Fils: Tables showing the production and destination of Messina lemons during the years 1911, 1912, and 1913.—Sc. & Ind. Bul. April, 1914, p. 50.

Rowland, E. O.: Formula for glycerin preparations of lemon and orange.—Pharm. J. 1914, v. 92, p. 544–545.

U. S. P. IX: For making the tincture the lemon peel is to be grated from the fresh fruit.—J. Am. Pharm. Assoc. 1914, v. 3, p. 547, and Abstr. Prop. Changes, Part 3, 1914, p. 24.

Bradford, H. C.: Formula and directions for making extracts of lemon for flavoring.—Drug. Circ. 1914, v. 58, p. 71–73.

Little, L. D.: A colorimetric method for the determination of citral in extracts of lemon and in oil of lemon.—J. Am. Pharm. Assoc. 1914, v. 3, p. 553–556.

Table showing some of the analytical results reported for extract of lemon.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E	21	7	Rep. Indiana Bd. Health, 1914, p. 396.
Hortvet, Julius	120	42	Rep. Minnesota D. & F. Com., 1914, p. 57.
Lynch, L. R	64	11	Rep. District of Columbia, Health Off. 1913, Washington, 1914, p. 90.
Lythgoe, Herman C	9	4	Rep. Massachusetts Bd. Health, 1913, 1914, p. 410.
Wiedemann, H. E	8	5	Rep. Missouri F. & D. Com. 1914, p. 39.

Hague, George W.: An official formula is needed for sirup of lemon. Many pharmacists use the soda-fountain sirup of lemon, which was official in one of the earlier pharmacopœias.—Merck's Rep. 1914, v. 23, p. 33.

LIMONIS SUCCUS.

Thurston, Azor: The commercial lemon juice, so called, is usually of inferior quality. Two samples were found to contain 4.55 and 5.67 per cent citric acid, while two samples of pure lemon juice were found to contain 6.97 and 7.79 per cent of citric acid, respectively.—Midl. Drug. 1914, v. 48, p. 363.

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Latham, Thomas: The liniments of the U. S. P. and the N. F., with a number of suggestions and modifications.—J. Am. Pharm. Assoc. 1914, v. 3, p. 234–237.

Curry, Gordon L.: Of the eight official liniments none requires any great amount of skill or labor to make.—Proc. Kentucky Pharm. Assoc. 1914, p. 58.

Linimentum aconiti et chloroformi, N. F.—Latham, Thomas: The excellent liniment of aconite and chloroform of the N. F. can be improved by the addition of menthol, 20 gm.—J. Am. Pharm. Assoc. 1914, v. 3, p. 235.

Linimentum ammonii.—U. S. P. IX: Oil of sesame to be used in making liniment of ammonia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Latham, Thomas: Suggests the use of a mixture of ammonia water, liquid petrolatum, and oleic acid in place of the formula now in use.—J. Am. Pharm. Assoc. 1914, v. 3, p. 234.

Linimentum Calcis.—Latham, Thomas: In making Carron oil it is important to use limewater of standard strength and to add the linseed oil to the limewater.—J. Am. Pharm. Assoc. 1914, v. 3, p. 234.

Linimentum Camphoræ.—U. S. P. IX: Liniment of camphor to be made by heating the camphor by agitation in oil previously heated on a water bath.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Mills, Ralph: The Pharmacopœia directions might be changed to read: Heat the oil in a flask on a water bath, add the camphor and dissolve without further heat.—Southern Pharm. J. 1914, v. 6, p. 536.

Seibert, O. J.: Camphor can be dissolved in sesame oil by first powdering the camphor by means of alcohol and placing it on a filter over which the sesame oil previously sterilized and then allowed to cool is poured.—Drug. Circ. 1914, v. 58, p. 324. See also Reum, Arthur: Pacific Pharm. 1914, v. 7, p. 311.

Latham, Thomas: Camphor liniment is improved by using yellow paraffin oil in place of cottonseed oil.—J. Am. Pharm. Assoc. 1914, v. 3, p. 234. See also Williams, Ed. E.: Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Moulton, Wm. C.: For making camphorated oil, the camphor may be shaved into small pieces by using an old-time tobacco cutter.—Bull. Pharm. 1914, v. 28, p. 296.

Orr, Will H.: For making camphor liniment without heat, introduce the camphor and cottonseed oil into a suitable flask and allow it to stand in a warm room for several days, agitating occasionally.—Bull. Pharm. 1914, v. 28, p. 209.

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Toplis, W. G.: Camphorated oil should be placed in dry, clean bottles and thoroughly corked before sterilization.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 363.

Fernau, Albert: A quantitative determination of the camphor content by determining the loss of weight at 100° or the saponification number according to Frey would be a desirable addition to the Ph. Austr.—Ztschr. allgem. österr. Apoth.-Ver. 1914, v. 52, p. 262.

Guthrie, C. P.: An outline of methods used to determine the camphor in 37 samples of camphor liniment examined.—Bull. Agric. Exper. Sta. North Dakota, 1914, v. 3, p. 84–85.

Table showing some of the analytical results reported for camphor liniment.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, L. A	4	2	Proc. Kentucky Pharm. Assoc. 1914, p. 120.
Editorial	26	2	Pharm. J. 1914, v. 92, p. 506.
Frary, Guy G	34	22	Rep. South Dakota F. & D. Com. 1914, p. 229, 261.
Guthrie, C. P	36	20	Bull. North Dakota Exper. Sta. Dept. 1914, v. 3, p. 83–85.
Jaffa, M. E	27	12	Rep. California Bd. Health (1910–1912), Sacramento, 1913, p. 297.
Thurston, Azor	5	3	Proc. Ohio Pharm. Assoc. 1914, p. 43; also Midl. Drug. 1914, v. 48, p. 363.
Todd, A. R	57	22	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R	47	16	Bull. Michigan D. & F. Dept. 1914, January-February, p. 17, March-April, p. 19, May-June, p. 27, July-August, p. 26, September-October, p. 16, November-December, p. 22.

Lanscoff, J. Leon: Camphorated oil in ampoules, simple apparatus for filling; illustrated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 689–691; also Merck's Rep. 1914, v. 23, p. 167.

Kollo, Konstantin: Ampoules of camphorated oil should be prepared with oil purified by the use of alcohol and should be sterilized by Tyndallizing at 80°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Miller, D. J. Milton: A child 18 months old was given a brimming teaspoonful of camphorated oil by mistake. No untoward symptoms resulted.—J. Am. M. Assoc. 1914, v. 63, p. 579.

Linimentum Chloroformi.—Latham, Thomas: The official chloroform liniment is too expensive for general use and too strong. A mixture of chloroform, methyl salicylate, and paraffin oil is recommended as a substitute.—J. Am. Pharm. Assoc. 1914, v. 3, p. 234–235.

Anon.: The official chloroform liniment is a clear, straw-colored liquid. A colorless preparation is open to suspicion.—Bull. Pharm. 1914, v. 28, p. 483.

Linimentum Iodi, N. F.—Latham, Thomas: Liniment of iodine can be considered obsolete. It is never used or dispensed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 236.

Linimentum Opii Compositus, N. F.—Latham, Thomas: On account of the high price and comparative uselessness of the expensive

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ingredients of compound liniment of opium, a modified formula containing one-tenth the amount of tincture of opium is suggested.—J. Am. Pharm. Assoc. 1914, v. 3, p. 236.

Linimentum Saponato-Camphoratum, N. F.—Latham, Thomas: This old composition is retained chiefly for historical interest. It may be made readily with any of the popular brands of white laundry soap which have a mixed base of cottonseed and coconut oils and readily solidify or jelly on cooling.—J. Am. Pharm. Assoc. 1914, v. 3, p. 236.

Linimentum Saponis.—U. S. P. IX: Directions for making modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1571, and Abstr. Prop. Changes, Part 6, 1914, p. 9.

Llewellyn, H. D.: The 1890 formula for soap liniment is preferable to that now included in the Pharmacopœia.—Proc. Missouri Pharm. Assoc. 1914, p. 142. See also Latham, Thomas: J. Am. Pharm. Assoc. 1914, v. 3, p. 235.

Todd, A. R.: Of 13 samples of soap liniment examined, 7 were found to be adulterated.—Rep. Michigan D. & F. Com. 1914, p. 176.

Todd, A. R.: Of eight samples of soap liniment examined, two were found to be adulterated, misbranded, or illegal.—Bull. Michigan D. & F. Dept. 1914, March-April, p. 19, July-August, p. 26.

Linimentum Saponis Mollis.—Latham, Thomas: Liniment of soft soap would be improved by using the cheap methyl salicylate instead of the dear oil of lavender for flavoring.—J. Am. Pharm. Assoc. 1914, v. 3, p. 235.

Linimentum Terebinthinæ.—U. S. P. IX: Added directions: "If thickened by cold, the liniment should be warmed sufficiently to render it fluid before dispensing;" otherwise no change in formula or directions.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Latham, Thomas: Liniment of turpentine could be improved by using petrolatum in place of rosin cerate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 235. See also Smalley, R.: Pharm. J. 1914, v. 92, p. 274. See also p. 461.

Linimentum Terebinthinæ Aceticum, N. F.—Latham, Thomas: This deservedly popular liniment has stood the test of about 150 years' use and when properly made is an elegant emulsion. A formula containing saponin and otherwise modified to reduce the cost of the preparation is recommended in place of the N. F. formula.—J. Am. Pharm. Assoc. 1914, v. 3, p. 236.

Linimentum Tiglii, N. F.—Latham, Thomas: Liniment of croton oil and compound liniment of croton oil are never used. The oil itself is seldom prescribed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 237.

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LINUM.

U. S. P. IX: The flaxseed may include not more than 3 per cent of other harmless fruits, seeds, and foreign matter. Flaxseed meal should be recently prepared and free from unpleasant or rancid odor. Ash not exceeding 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 388, and Abstr. Prop. Changes, Part 2, 1914, p. 30.

Winton, Kate B.: The histology of the flax fruit; illustrated.—Bot. Gaz. 1914, v. 58, p. 445–448.

News Note: A review of the flaxseed situation.—Oil, Paint & Drug Rep. 1914, v. 85, February 9, p. 18. See also March 16, p. 9, and Drugs, Oils & Paints, 1914, v. 29, p. 368–369.

Noyes, C. R.: Linseed depends for its value wholly upon the presence of linseed oil and yet ground flaxseed, or linseed meal of the market, is very frequently a product which has been partly reduced to the condition of ground oil cake.—J. Am. Pharm. Assoc. 1914, v. 3, p. 856, and Proc. Minnesota Pharm. Assoc. 1914, p. 192. See also Midl. Drug. 1914, v. 48, p. 145–146.

Collins and Blair: The rate of liberation of hydrocyanic acid from linseed.—Analyst, 1914, v. 49, p. 70–74.

Van Kampen, G. B.: On the amount of water-soluble carbohydrates in linseed.—Chem. Weekblad, 1914, v. 11, p. 142–146.

J. D. Riedel, A. G.: Linseed contained from 3.3 to 4.5 per cent of ash and from 15.6 to 20 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 33.

Jensen, H. R.: One sample of crushed seeds left 3.1 per cent ash, and contained 35.5 per cent of oil, with iodine value 182, refractive index 1.4826.—Evans' An. Notes, 1914, p. 43.

Mayer, Joseph L.: The oil content of eight samples of ground flaxseed was found to vary from 33.31 to 35.46 per cent.—Proc. New York Pharm. Assoc. 1914, p. 115.

LIQUORES.

U. S. P. IX: Changes and new standards for solutions.—J. Am. Pharm. Assoc. 1914, v. 3, p. 527–533, and Abstr. Prop. Changes, Part 3, 1914, p. 4–10.

Mittelbach, Wm.: The official solutions will probably receive more attention than any other group and processes for assaying them are being adopted.—Proc. Missouri Pharm. Assoc. 1914, p. 106.

Curry, Gordon L.: Of the 25 official solutions, only 1, the solution of formaldehyde, can not be made advantageously in the retail drug store.—Proc. Kentucky Pharm Assoc. 1914, p. 58.

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LIQUOR ANTISEPTICUS.

LaWall, Charles H.: A new and satisfactory formula for liquor antisepticus. The product is thought to be more pleasant and fragrant than that yielded by the formula now in the U. S. P. VIII.—J. Am. Pharm. Assoc. 1914, v. 3, p. 507; also Nat. Druggist, 1914, v. 44, p. 452.

LIQUOR ANTISEPTICUS ALKALINUS, N. F.

LaWall, Charles H.: A new and satisfactory formula for liquor antisepticus alkalinus, to replace the formula now in the N. F. III.—J. Am. Pharm. Assoc. 1914, v. 3, p. 508; also Nat. Druggist, 1914, v. 44, p. 452, and Apothecary, 1914, v. 26, January, p. 20.

McElhenie, Thos. D.: Suggests the name "Alkantus" for the alkaline antiseptic solution of the National Formulary.—J. Am. Pharm. Assoc. 1914, v. 3, p. 276. See also Drug. Circ. 1914, v. 58, p. 195.

Hague, George W.: In alkaline antiseptic solution the color fades on standing.—Merck's Rep. 1914, v. 23, p. 33.

Puckner, W. A.: A report on glyco-thymoline and the evident variations in its composition.—Rep. Council Pharm. Chem. 1914, p. 54–57.

Editorial: Glyco-thymoline is inferentially recommended in such serious conditions as diphtheria, ophthalmia in the new-born, consumption, etc. The danger of such recommendations, even though made indirectly rather than directly, are patent to every thinking physician.—J. Am. M. Assoc. 1914, v. 63, p. 1305.

LIQUOR CALCIS.

Williams, Ed. E.: A magma of calcium hydrate should be made official for the preparation of lime water. Preserved in suitably sized bottles, paraffin stoppered, it is a permanent preparation.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Anderson, F. A.: Apparatus for preparing lime water, or the like, for use in softening or purifying water. English Patent 3504, February 11, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 331.

Raubenheimer, Otto: Do not prepare liquor calcis by mixing together a pail of hydrant water and a lump of ordinary mason's lime by means of a broom handle, but use U. S. P. process, employing calcium oxide and distilled water.—Jour. New Jersey Pharm. Assoc. 1914, p. 36.

Howard, Charles D.: A specimen of lime water tablet examined showed 42 per cent of the U. S. P. requirement when made up according to the instructions.—Bull. New Hampshire Bd. Health, 1914, v. 3, p. 67.

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Table showing some of the analytical results reported for lime water.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, L. A.	5	1	Proc. Kentucky Pharm. Assoc. 1914, p. 119.
Brown, Lucius P.	7	0	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Summers, A. C.	23	4	Rep. South Carolina Agric. Com. & Ind. 1914, v. 10, p. 208.
Todd, A. R.	1	0	Rep. Michigan D. & F. Com. 1914, p. 176.
Wiedemann, H. E.	72	16	Rep. Missouri F. & D. Com. 1914, p. 23–24.

LIQUOR CALCIS SULPHURATÆ, N. F.

Mayer, Joseph L.: Preparation and analysis of Vleminck's solution.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1000–1002; also Am. J. Pharm. 1914, v. 86, p. 355–358.

LIQUOR CHLORI COMPOSITUS.

U. S. P. IX: Rubric to read: "A mixture of chlorine and chlorine oxides equivalent to at least 0.35 gm. of chlorine in each 100 cc. of the solution." Modified tests and a method of assay included.—J. Am. Pharm. Assoc. 1914, v. 3, p. 528, and Abstr. Prop. Changes, Part 3, 1914, p. 5.

LIQUOR CRESOLIS COMPOSITUS.

U. S. P. IX: Modified formula. Linseed oil reduced to 300 gm. to be saponified with the aid of heat before the addition of the cresol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 528, and Abstr. Prop. Changes, Part 3, 1914, p. 5.

Maines and Gardner: An improved formula for compound solution of cresol, including the suggestion to saponify the potassium hydroxide before adding the cresol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1325. See also Mills, Ralph: Southern Pharm. J. 1914, v. 6, p. 535, and Williams, Ed. E.: Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Bray, Wm.: For making compound cresol solution recommends the use of equal parts of sapo mollis and cresol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 901. See also Norwood, T. W.: Drug. Circ. 1914, v. 58, p. 390, and Curry, Gordon L.: Proc. Kentucky Pharm. Assoc. 1914, p. 58.

Nixon, C. F.: For compound solution of cresol, cotton seed oil should be used instead of linseed oil.—Apothecary, 1914, v. 26, January, p. 20. See also Endress, John C.: Bull. Pharm. 1914, v. 28, p. 339, and E'we and Vanderkleed: Proc. Pennsylvania Pharm. Assoc. 1914, p. 277.

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Goerlich, R.: The valuation of the Ph. Germ. V solution of cresol.—Pharm. Ztg. 1914, v. 59, p. 580–582. See also Herzog and Kleinmichel: Apoth.-Ztg. 1914, v. 29, p. 402–403, and Anon.: Südd. Apoth.-Ztg. 1914, v. 54, p. 341.

Report of the Pharmacy Board of Victoria: The increasing number of fatalities through the improper use of lysol was a matter of anxiety to the board in the early part of the year.—Chem. & Drug. Australas. 1914, v. 29, p. 123. See also p. 358.

Xrayser II: Lysol is a descriptive term and as such it is claimed should not be in the register at all.—Chem. & Drug. 1914, v. 85, p. 479.

LIQUOR FERRI ALBUMINATI, N. F.

Wastenson, Hugo: The official Swedish solution of iron albuminate and the precautions to be observed in preparing it.—Svensk farm. Tidskr. 1914, v. 18, p. 233–235.

Solonoutz, J.: The Ph. Ross. V formula for solution of iron albuminate yields a uniformly satisfactory preparation.—Pharm. Ztg. 1914, v. 59, p. 252–253.

Lefeldt, M.: The Ph. Germ. V should permit of a slight variation in the iron content of solution of iron albuminate.—Pharm. Ztg. 1914, v. 59, p. 42.

Arends, Georg: In making solution of iron albuminate, it is preferable to first determine the exact amount of albumin necessary to bring the iron into complete solution.—Apoth.-Ztg. 1914, v. 29, p. 987.

J. D. Riedel, A.-G.: The specific gravity of the Ph. Germ. V preparation was found to vary from 0.980 to 0.990, the dry residue from 2.1 to 2.4 per cent, and the iron content from 0.39 to 0.40.—Riedel's Berichte, 1914, p. 45.

LIQUOR FERRI ET AMMONII ACETATIS.

U. S. P. IX: Specific gravity about 1.0385. Tests modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 528, and Abstr. Prop. Changes, Part 3, 1914, p. 5.

McClure, Berthier: A quick and practical method for dispensing Basham's mixture. Make the solution without iron and add a sufficient quantity of tincture of chloride of iron when needed.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 344.

Williams, Ed. E.: Basham's mixture should be kept on ice and is a permanent preparation when so stored.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

LIQUOR FERRI PEPTONATI CUM MANGANO, N. F.

Williams, Ed. E.: In manufacturing the N. F. solution of peptonate of iron and manganese be particular to use a peptonate of iron devoid of odor.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

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J. D. Riedel, A.-G.: The specific gravity of solution of peptonate of iron and manganate was found to vary from 1.049 to 1.053, the dry residue from 14.5 to 15.8 per cent, and the iron content from 0.61 to 0.66 per cent.—Riedel's Berichte, 1914, p. 45.

Puckner, W. A.: Report on Pepto-Mangan (Gude).—Rep. Council Pharm. Chem. 1914, p. 121–123.

LIQUOR FORMALDEHYDI.

U. S. P. IX: To permit from 7 to 14 per cent of methyl alcohol to prevent polymerization. Specific gravity from 1.070 to 1.095 at 25°. Yield of ash on ignition should not exceed 0.05 per cent. Tests modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 529, and Abstr. Prop. Changes, Part 3, 1914, p. 6.

von Hochstetter, H.: U. S. Patent 1,110,289. The manufacture of formaldehyde.—J. Ind. & Eng. Chem. 1914, v. 6, p. 1050. See also Pollak, E.: J. Soc. Chem. Ind. 1914, v. 33, p. 218.

Fernau, Albert: For solution of formaldehyde a minimum content of 38 volume per cent or 35 weight per cent would be preferable to the present requirement of the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 253.

Dunning, H. A. B. Detection and estimation of minute quantities of formaldehyde in presence of hexamethylenamine and of methyl alcohol in presence of ethyl alcohol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 637–641.

Fincke, Heinrich: On the detection of minute quantities of formaldehyde and of several formaldehyde combinations by means of fuchsin-sulphurous acid-hydrochloric acid.—Ztschr. unters. Nahr. u. Genuss. 1914, v. 27, p. 246–253.

Stüwe, W.: The determination of formaldehyde, hexamethylenetetramine, and formalin pastilles.—Arch. Pharm. 1914, v. 252, p. 430–435; also Südd. Apoth.-Ztg. 1914, v. 54, p. 638.

Redman, Weith and Brock: The determination of phenol in the presence of hexamethylenetetramine and formaldehyde.—J. Ind. & Eng. Chem. 1914, v. 6, p. 205–206.

Rupp, E.: Outline of method for determining the formaldehyde content according to Romijn.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 314.

Linke, H.: Twelve samples of solution of formaldehyde were found to comply with the Ph. Germ. V requirements.—Apoth.-Ztg. 1914, v. 29, p. 683.

Mayer, Joseph L.: Ten samples of formaldehyde solution contained 35.01 per cent to 37.61 per cent of formaldehyde.—Proc. New York Pharm. Assoc. 1914, p. 115.

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E'we, G. E.: Of 11 samples of formaldehyde solution tested, 9 tested from 37 to 39.9 per cent, while the other 2 tested 36.8 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 138.

Dunlop, J. G. M.: The action of sulphuric acid on paraformaldehyde.—J. Chem. Soc. Lond. 1914, v. 105, p. 1155–1157.

Anon.: Directions for using the permanganate process for the generation of formaldehyde.—Pharm. Era, 1914, v. 47, p. 465.

Dixon, Samuel G.: Sodium dichromate and sulphuric acid as a substitute for potassium permanganate to liberate formaldehyde gas from a water solution.—J. Am. M. Assoc. 1914, v. 63, p. 1025.

Auerbach and Plüddemann: Studies of formaldehyde. IV. The vaporization of formaldehyde and its polymers.—Arb. k. Gsndhtsamte, 1914, v. 47, p. 116–132.

Croner, Fr.: The influence of methyl alcohol on the disinfectant action of formaldehyde and the conclusions derived therefrom.—Ztschr. Hyg. 1914, v. 78, p. 541–554.

Löwenstein, Walter: The disinfection of dwellings by means of formaldehyde.—Ztschr. Hyg. 1914, v. 78, p. 363–384.

Hamilton, Herbert C.: Formaldehyde is limited in its usefulness to its application as a gaseous disinfectant.—Therap. Gaz. 1914, v. 38, p. 313.

Mayer, O.: On the penetrating properties of formaldehyde vapors in steam disinfection apparatus, with or without reduced atmospheric pressure.—Münch. med. Wchnschr. 1914, v. 61, p. 132.

Dreyfus, Wm.: Review of formaldehyde fumigation.—Am. J. Public Health, 1914, v. 4, p. 1046–1049.

Anon.: There is no experimental evidence on which to base an opinion as to the actual efficiency of any of the commercially available formaldehyde sterilizers.—J. Am. M. Assoc. 1914, v. 62, p. 476.

Pabst, Charles F.: Why fumigation fails.—Med. Rec. 1914, v. 86, p. 1052.

McGuigan, Hugh: A study of the migration, fate, and changes of formaldehyde in the body.—J. Am. M. Assoc. 1914, v. 62, p. 984–989.

Serger, H.: Review of some of the recent literature relating to formaldehyde as a chemical preservative.—Chem.-Ztg. 1914, v. 38, p. 209–210.

For additional references on formaldehyde see Index Med; J. Am. M. Assoc.; Chem. Abstr.; and J. Chem. Soc. Lond.

LIQUOR MAGNESII CITRATIS.

U. S. P. IX: Formula to include the use of purified talc. To direct solutions to be heated to the boiling point before filtration.—J. Am. Pharm. Assoc. 1914, v. 3, p. 530, and Abstr. Prop. Changes, Part 3, 1914, p. 7.

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Blomberg, C.: The introduction, uses, and composition of magnesium citrate, first used in Italy about the middle of the nineteenth century.—Pharm. Zentralh. 1914, v. 55, p. 1045–1046.

Mills, Ralph: Solution of magnesium citrate will keep longer if recently boiled distilled water is used in making it and the bottle is rinsed with boiling distilled water before being used.—Southern Pharm. J. 1914, v. 6, p. 536.

Brown, J. Lee: A formula for solution of magnesium citrate made by the aid of heat.—J. Am. Pharm. Assoc. 1914, v. 3, p. 968–969.

Possehl, J. J.: A revised formula and method of procedure for making solution of magnesium citrate.—Proc. Wisconsin Pharm. Assoc. 1914, p. 78–79. See also Reum, Arthur: Pacific Pharm. 1914, v. 8, p. 83–84.

Rhode, R. E.: Solution of magnesium citrate should be made by the cold process and with spirit of lemon instead of the oil.—J. Am. Pharm. Assoc. 1914, v. 3, p. 901.

Toplis, W. G.: Solution of magnesium citrate should be sterilized before adding the potassium bicarbonate.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 362.

Weinstein, Joseph: A prominent New York pharmacist is reported to have advocated the use of his formula which does away with most of the citric acid and magnesium carbonate, replacing same with sodium phosphate.—Proc. New York Pharm. Assoc. 1914, p. 116.

Brown, Linwood A.: The assay of effervescent solution of magnesium citrate. Outline for the determination of free citric acid, total citric acid, and magnesium oxide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 643.

Hill, C. A.: Of 124 samples of solution of magnesium bicarbonate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 3 parts per million. The arsenic content varied from 0 to 0.8 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

McGill A.: Examination of 52 samples of the product sold as effervescent citrate of magnesia showed that it consists chiefly of magnesium sulphate (Epsom salt) with variable quantities of sodium citrate, sodium tartrate, and sugar.—Bull. Lab. Inland Rev. Dept. Ottawa, 1914, No. 297, p. 11.

LIQUOR PLUMBI SUBACETATIS.

U. S. P. IX: Method of assay modified. Tests for limit of iron and copper added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 530, and Abstr. Prop. Changes, Part 3, 1914, p. 7.

LIQUOR POTASSII ARSENITIS.

U. S. P. IX: Rubric to require the equivalent of not less than 0.975 and not more than 1.025 per cent of arsenic trioxide. Test for arsenic

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added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 530, and Abstr. Prop. Changes, Part 3, 1914, p. 7.

Richter, O.: A review of the Ph. Germ. V method for making solution of potassium arsenite.—Apoth.-Ztg. 1914, v. 29, p. 962–963.

Mills, Ralph: In making the solution of potassium arsenite it will be advantageous to place the material in a flask rather than a tared dish.—Southern Pharm. J. 1914, v. 6, p. 535.

Llewellyn, H. D.: The 1890 formula for Fowler's solution had the advantage of bringing the finished product up to 1,000 cc. instead of 1,000 gm.—Proc. Missouri Pharm. Assoc. 1914, p. 142.

E'we and Vanderkleed: Rate of oxidation of arsenite in Fowler's solution.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 277. See also p. 154 and J. Am. Pharm. Assoc. 1914, v. 3, p. 1682.

Table showing some of the analytical results reported for solution of potassium arsenite.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, L. A	48	35	Proc. Kentucky Pharm. Assoc. 1914, p. 117.
Congdon, Leon A	1	0	Rep. Kansas Bd. Health, 1914, p. 100.
Frary, Guy G	5	2	Rep. South Dakota F. & D. Com., 1914, p. 227, 340.
Summers, A. C	44	10	Rep. South Carolina Com. Agric. Com. & Ind., 1914, v. 10, p. 208.
Todd, A. R	14	1	Rep. Michigan D. & F. Com., 1914, p. 176.
Todd, A. R	8	4	Bull. Michigan D. & F. Dept., 1914—May-June p. 27; July-August, p. 26; September-October, p. 16.
Wiedemann, H. F	42	37	Rep. Missouri F. & D. Com., 1914, p. 39.
Woods, Chas. D	12	12	Off. Insp. Maine Agric. Expr. Sta., 1913, No. 48, p. 24–25.

Becker, Henry C.: For the prevention of the acne that is apt to follow the administration of bromides, Fowler's solution in 5 or 10 minim doses three times daily is to be recommended.—Merck's Arch. 1914, v. 16, p. 36.

Editorial: Fowler's solution is of greatest service as a blood maker in debility with anemia.—Eclectic M. J. 1914, v. 74, p. 377–378.

LIQUOR SODÆ CHLORINATA.

U. S. P., IX: Rubric to read at least 2.5 per cent by weight of available chlorine. Modified formula and modified method of assay.—J. Am. Pharm. Assoc. 1914, v. 3, p. 531, and Abstr. Prop Changes, Part 3, 1914, p. 8.

Spencer, Leo: Photokinetics of sodium hypochlorite solutions.—J. Chem. Soc. Lond. 1914, v. 105, p. 2565–2576.

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LIQUOR SODII PHOSPHATIS COMPOSITUS.

Williams, Ed. E.: Compound solution of sodium phosphate molds and crystallizes on standing and is hard to get the salt into solution.—Proc. Wisconsin Pharm. Assoc. 1914, p. 21.

Norwood, T. W.: The official compound solution of sodium phosphate is unnecessarily complicated. A satisfactory solution can be made by dissolving sodium phosphate 1,000 gm., phosphoric acid, 25 per cent, 100 gm., in water sufficient to make 1,000 cc.—Drug. Circ. 1914, v. 58, p. 390.

LITHII CARBONAS.

Fernau, Albert: A test for magnesium carbonate should be added.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Daniels, Amy L.: The influence of lithium and atophan on the uric acid excretion of a gouty patient.—Arch. Int. Med. 1914, v. 13, p. 480–484.

LITHII CITRAS.

Baker, W. L.: Lithium citrate did not conform to the U. S. P. in purity test.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Hill, C. A.: Of 52 samples of lithium citrate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 8 parts per million. The arsenic content varied from 0 to 0.3 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

LOBELIA.

U. S. P., IX: Family name changed from "Campanulaceæ" to "Lobeliaceæ." Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 389, and Abstr. Prop. Changes, Part 2, 1914, p. 31.

Baker, W. L.: One sample of lobelia was rejected because it was mostly stalk and but very few leaves.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Rippetoe, J. R.: One sample of lobelia was found to contain 18.42 per cent of alcohol (49 per cent) extract and 8.15 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

J. D. Riedel, A.-G.: Lobelia contained from 5.1 to 11.4 per cent of ash and from 14.7 to 17.7 per cent of extract soluble in diluted (70 per cent) extract.—Riedel's Berichte, 1914, p. 32.

Maines, E. L.: Lobelia herb was found to contain 8.04 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Vanderkleed, C. E.: Reports one assay of lobelia: 0.838 per cent alkaloids; above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

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Atkinson, Richard M.: History of lobelia; a review.—Eclectic M. J. 1914, v. 74, p. 565.

Harbold, John E. L.: Lobelia, given hypodermatically, will seldom, if ever, nauseate a patient.—Ellingwood's Therap. 1914, v. 8, p. 412. See also Shirack, C. J.: Eclectic M. J. 1914, v. 74, p. 567–569.

Simes, Charles A.: Lobelia in broncho-pneumonia.—Ellingwood's Therap. 1914, v. 8, p. 173–174. See also Snow, H.: Eclectic M. J. 1914, v. 74, p. 565.

Woodward, C.: The antispasmodic property of lobelia.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 334–336.

Editorial: Lobelia locally applied relieves rhus poisoning, is one of the best remedies known for bronchial asthma, and is a good cardiac stimulant.—Phys. Drug News, 1914, v. 9, p. 363. See also Braun, Israel: Merck's Arch. 1914, v. 16, p. 106.

LUPULINUM.

U. S. P. IX.: A granular powder, bright yellowish brown, having the characteristic odor and taste of hops. Ash not exceeding 16 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 390, and Abstr. Prop. Changes, Part 2, 1914, p. 32.

Baker, W. L.: Five lots of lupulin were rejected. They were deficient in ether soluble content and ash content was high.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Table showing reported variation in ash content of lupulin.

Reporters.	Number of samples.	Ash.		References.
		Minimum.	Maximum.	
Caesar & Loretz.....	17	11.8	29.8	Jahres-Ber. 1914, p. 39.
E'we, G. E.....	4	16.0	20.8	Proc. Pennsylvania Pharm. Assoc. 1914, p. 145.
Rippetoe, J. R.....	4	20.02	49.07	Am. J. Pharm., 1914, v. 86, p. 440.
Roberts, J. G.....	3	6.53	19.07	Proc. Pennsylvania Pharm. Assoc. 1914, p. 144.
Scoville, W. L.....	4	2.4	30.9	J. Am. Pharm. Assoc. 1914, v. 3, p. 1288.

LYCOPODIUM.

U. S. P. IX: The spores of *Lycopodium clavatum*, with not more than 2 per cent of impurities. Ash not exceeding 3 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 390, and Abstr. Prop. Changes, Part 2, 1914, p. 32.

Caesar & Loretz: The valuation of lycopodium, with table showing the requirements included in the several pharmacopœias.—Jahres-Ber. 1914, p. 89.

Richter, Ernst: One sample of lycopodium found to contain wheat starch.—Apoth.-Ztg. 1914, v. 29, p. 211.

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Anselmino and Gilg: A lycopodium substitute was found to be mixed with starch, shellac, and rosin and contained about 9 per cent of ash.—Arb. pharm. Inst. Univ. Berl. 1914, p. 46–47.

Lewis, S. Judd: The moisture in a specially resifted sample of lycopodium amounted to 4.13 per cent, and the ash on the dry drug to 1.49 per cent.—Pharm. J. 1914, v. 92, p. 128; also Year-Book of Pharmacy, 1914, p. 367.

Maines, E. L.: Lycopodium was found to contain from 0.27 to 1.44 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Caesar & Loretz: Ten samples of lycopodium were found to contain from 1.4 to 5.85 per cent of ash. Only one of the samples exceeded 3 per cent.—Jahres-Ber. 1914, p. 39.

Rippetoe, J. R.: One sample of lycopodium contained 8.61 per cent of ash, which was chiefly calcium carbonate.—Am. J. Pharm. 1914, v. 86, p. 444.

Linke, H.: Two samples of lycopodium gave 1.84 and 2 per cent of ash, respectively.—Apoth.-Ztg. 1914, v. 29, p. 567.

J. D. Riedel, A.-G.: Lycopodium contained from 1.4 to 2.7 per cent of ash and from 20.2 to 21.8 per cent of extract soluble in alcohol.—Riedel's Berichte, 1914, p. 32.

MAGMA BISMUTHI.

U. S. P. IX: Magma bismuthi to contain an amount of bismuth hydroxide equivalent to not less than 5.50 gm. nor more than 6 gm. of bismuth oxide, in each 100 cc. Directions for making and the method of assay to be given.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1571–1572, and Abstr. Prop. Changes, Part 6, 1914, p. 9–10.

Müller, S. Bertha: A modified formula with directions for making magma of bismuth.—Am. J. Pharm. 1914, v. 86, p. 7–11.

Anon.: The Raubenheimer formula for milk of bismuth is reprinted.—Drug. Circ. 1914, v. 57, p. 729.

MAGMA MAGNESIÆ, N. F.

Williams, Ed. E.: The N. F. formula for milk of magnesia yields an unsatisfactory jellylike product.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23. See also Mills, Ralph: Southern Pharm. J. 1914, v. 6, p. 536, and Merck's Rep. 1914, v. 23, p. 33.

Hensel, Samuel T.: Magma magnesia; a discussion of the formula proposed by Beringer.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1117–1120; also Rocky Mountain Drug. 1914, v. 28, June, p. 8–10.

LaWall, Charles H.: The assay of magma magnesiæ. Examination of 12 samples of the product showed them to vary from 2.22 to 9.57 per cent of magnesium hydroxide.—Proc. New Jersey Pharm. Assoc. 1914, p. 78–80; also J. Am. Pharm. Assoc. 1914, v. 3, p. 1002–1003.

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Dunlop, Thomas: The available products of mixture of magnesium hydroxide are very variable, some nearly solid. The problem to be solved lies in the treatment of the magnesium hydroxide after it has been collected.—Pharm. J. 1914, v. 93, p. 485.

Blair, H. C.: The making of magma magnesiæ should be left alone unless some one discovers how to make it properly and is willing to instruct us.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 346.

MAGNESII CARBONAS.

Fernau, Albert: Commercial preparations of magnesium carbonate invariably contain traces of iron. This should be recognized by the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Kolthoff, I. M.: The composition of the official Ph. Ndl. IV magnesium carbonate.—Pharm. Weekblad, 1914, v. 51, p. 1287–1291.

Stockinger, O.: Several lots of magnesium carbonate were found to contain an excessive amount of calcium. A sample from one barrel contained 10.34 per cent of calcium, calculated as calcium carbonate Of the three samples examined, one assayed 98.5 per cent and the other two each 94 per cent of magnesium carbonate after ignition. U. S. P. requires 96 per cent. One of the samples contained calcium in excess of the U. S. P. limit; in other respects they were strictly U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 145.

Mann, E. W.: One sample of magnesium carbonate when mixed with a limited quantity of water formed a fairly hard cement. On examination it was found that a considerable proportion of calcined magnesia was present.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 45.

Hill, C. A.: Of 210 samples of heavy magnesium carbonate examined during the years 1910 to 1913, inclusive, the lead content varied from 1 to 70 parts per million. The arsenic content varied from 0 to 9 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

MAGNESII OXIDUM.

Fernau, Albert: Commercial preparations of magnesium oxide invariably contain traces of iron. This should be recognized by the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Baker, W. L.: Heavy magnesium oxide was found to contain an excess of calcium.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211. See also Richter, Ernst: Apoth.-Ztg. 1914, v. 29, p. 211.

Stockinger, R.: Only one of the four samples of light magnesia examined came up to the U. S. P. requirement of 96 per cent MgO after ignition.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 146.

Hill, C. A.: Of 72 samples of heavy magnesia examined during the years 1910 to 1913, inclusive, the lead content varied from 3 to 200

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parts per million. The arsenic content varied from 0.2 to 12 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

MAGNESII SULPHAS.

Foulk and Sweeny: The sulphate method for standardizing a magnesium salt solution.—J. Am. Chem. Soc. 1914, v. 36, p. 2360–2372.

Baker, W. L.: Magnesium sulphate contained an excess of heavy metals.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Mann, E. W.: Some specimens of magnesium sulphate contain an excessive proportion of chlorides. The highest figure recorded is 0.25 per cent, calculated as magnesium chloride.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 45.

Roberts, J. G.: One lot of magnesium sulphate contained 1 per cent of chlorides computed as magnesium chloride.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 145.

Hill, C. A.: Of 400 samples of magnesium sulphate examined during the years 1911 to 1913, inclusive, the lead content varied from 0 to 80 parts per million. The arsenic content varied from 0.1 to 1.2 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

Glickman, L. H.: A large variation in the moisture content of dried and powdered sulphate has been observed. Six lots tested 29, 26, 23, 17, 20.3, and 7.46 per cent water, respectively.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 145.

Umney and Bennett: Dried magnesium sulphate should contain not less than 23 per cent and not more than 31 per cent of water.—Pharm. J. 1914, v. 93, p. 135–136; also Year-Book of Pharmacy, 1914, p. 408.

Stransky, Emil: An examination of magnesium narcosis. Report of animal experiments.—Arch exper. Path. u. Pharmakol. 1914, v. 78, p. 122–153. See also Starkenstein, E.: Zentralbl. Physiol. 1914, v. 28, p. 63–70.

Gates and Meltzer: The depressive action of magnesium sulphate and sodium oxalate and the rapid antagonistic action of calcium.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 97; see also p. 23–24.

Mielke, F.: A contribution on the treatment of tetanus by means of magnesium sulphate.—Therap. Monatsh. 1914, v. 28, p. 259–260. See also v. Roznowski, J.: Therap. Gegenw. 1914, v. 55, p. 435–439.

Usener, Walther: Indications for the subcutaneous injection of magnesium sulphate in the treatment of traumatic tetanus.—Münch. med. Wchnschr. 1914, v. 61, p. 2323–2324. See also Eunike, Kurt Werner, p. 2225–2226; Stadler, H.: Berl. klin. Wchnschr. 1914, v. 51, p. 15–18, 109–113, and Weintraub, W., p. 1717–1721.

Thirolaix and Mairease: The use of magnesium sulphate in the treatment of acute articular rheumatism.—Bull. gén. therap. 1914, v. 168, p. 95–97.

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Freese, E. M.: Magnesium sulphate and glycerin in the treatment of infections.—New York M. J. 1914, v. 99, p. 331–333.

Bryant, W. Sohier: Magnesium sulphate in purulent cerebrospinal streptococcic meningitis.—Boston M. & S. J. 1914, v. 171, p. 812–815.

Auer and Meltzer: Fatal action of magnesium sulphate by absorption from the intestines.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 524; also Proc. Soc. Exp. Biol. 1914, v. 11, p. 95.

For additional references see Index Med.; Zentralbl. exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

MALTUM.

U. S. P. IX: The temperature for maceration and evaporation in the manufacture of malt extract not to exceed 60°. Specific gravity not less than 1.350 nor more than 1.400 at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 536, and Abstr. Prop. Changes, Part 3, 1914, p. 13.

J. D. Riedel, A.-G.: For the valuation of malt extracts the physical characteristics such as color, taste, and odor are important.—Pharm. Zentralbl. 1914, v. 55, p. 350; also Riedel's Berichte, 1914, p. 33–40.

Graber, Howard T.: Laboratory studies on malt extract. Malt extract even after having changed to an almost black color and having a disagreeable taste is not necessarily inactive, and when properly made it is potent for at least one year.—J. Ind. & Eng. Chem. 1914, v. 6, p. 403–404.

Mounier, A.: The determination of the diastasic power of extract of malt.—Ann. chim. analyt. 1914, v. 19, p. 51–54.

Duryea, Chester B.: Industrial maltose; a review of the origin and development of the industry.—J. Ind. & Eng. Chem. 1914, v. 6, p. 419–423. See also J. Am. Chem. Soc. 1914, v. 36, p. 2385–2397, and Daish, A. J.: J. Chem. Soc. Lond. 1914, v. 105, p. 2052–20723.

MANNA.

Dorveaux, P.: The method of collecting manna in Sicily in 1776; illustrated.—Bull. sc. pharmacol. 1914, v. 21, p. 107–111.

Smit, Jan: On the methods for the quantitative determination of mannite; experimental observations.—Ztschr. Anal. Chem. 1914, v. 53, p. 470–490.

van Ekenstein and Blanksma: Observations on the crystallization of levo-rotatory mannose.—Chem. Weekblad, 1914, v. 11, p. 902.

Rippetoe, J. R.: Two samples of manna were found to contain 98.21 and 99.45 per cent of alcohol (67 per cent) extract and 1.16 and 0.57 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

Maines, E. L.: Manna was found to contain 0.62 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

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MARRUBIUM.

Kremers, Edward: Illustrated description of *Marrubium vulgare* L.—Bull. Wisconsin Univ. 1914, No. 738, p. 16.

Rippetoe, J. R.: One sample of marrubium was found to contain 18.16 per cent of alcohol (49 per cent) extract and 14.66 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

MASSA FERRI CARBONATIS.

U. S. P. IX: Method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1572, and Abstr. Prop. Changes, Part 6, 1914, p. 10.

Metz, LeRoy: A formula for an improved mass of ferrous carbonate.—Pract. Drug. 1914, v. 32, p. 104–105.

MASTICHE.

Dietrich, Karl: A study of factitious and distilled mastic.—Pharm. Ztg. 1914, v. 59, p. 912.

Rippetoe, J. R.: Five samples of mastic were found to contain from 81.10 to 91.20 per cent of alcohol extract and from 0.15 to 0.56 per cent of ash. Acid number from 52.78 to 58.50.—Am. J. Pharm. 1914, v. 86, p. 440.

van Itallie, E. I.: A preparation widely recommended as a surgical dressing was found to be a solution of mastic in benzol with some methyl salicylate and rosin added.—Pharm. Weekblad, 1914. v. 51, p. 1184–1187; also Apoth.-Ztg. 1914, v. 29, p. 848, Pharm. Ztg. 1914, v. 59, p. 708, and Pharm. Post, 1914, v. 47, p. 733, 777, 857.

MATICO.

Rippetoe, J. R.: Three samples of matico leaves were found to contain from 10.80 to 15.70 per cent of alcohol extract and from 14.50 to 15.60 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

Adlerman, Theodore Davis: Piper methysticum is a stand-by in the very obstinate cases of tic douloureux and facial neuralgia.—Eclectic M. J. 1914, v. 74, p. 8.

MATRICARIA.

U. S. P. IX: The dried flower heads of *Matricaria chamomilla*, with not more than 5 per cent of stems and foreign matter. Ash not exceeding 13 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 390, and Abstr. Prop. Changes, Part 2, 1914, p. 32.

Power and Browning, jr.: The constituents of the flowers of *Matricaria chamomilla*.—J. Chem. Soc. Lond. 1914, v. 105, p. 2280–2291; also Proc. Chem. Soc. 1914, v. 30, p. 237.

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Maines, E. L.: Chamomile flowers were found to contain from 2 to 2.64 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Rippetoe, J. R.: One sample of Belgian chamomile flowers was found to contain 22.58 per cent of alcohol extract and 5.56 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 457.

J. D. Riedel, A.-G.: Chamomile flowers contained from 12.4 to 14.8 per cent of ash and from 28.9 to 30.8 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Quinn, Janet D.: *Matricaria chamomilla* is an old remedy seldom used at the present time. Its properties are tonic, diaphoretic, mild emetic, and antispasmodic.—Eclectric M. J. 1914, v. 74, p. 400.

MEL.

Anon.: The second supplement to the Ph. Ndl. IV includes several modifications of the requirements for honey.—Pharm. Weekblad, 1914, v. 51, p. 85.

Fernau, Albert: The Ph. Austr. VIII requirement that an aqueous solution of honey be not darkened by ammonia is too stringent.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Gothe, F.: Experimental studies on the properties and action of honey diastase.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 286–321.

Kreutschmar, H.: The examination of honey; a report on 58 samples.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 84–89.

Nottbohn and Weinhauser: The determination of sulphur in honey and other sugar-containing substances.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 581–587.

Ledent, René: A contribution to the study of Belgian honeys, with a report on 19 samples.—Bull. Soc. Chim. Belg. 1914, v. 28, p. 73–77.

Utz: A review of some of the recent literature relating to honey and the chemical examination of honey.—Pharm. Praxis, 1914, v. 12, p. 481–483.

Table showing some of the analytical results reported for honey.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	6	0	Rep. Indiana Bd. Health, 1914, p. 397.
Beythien and Hempel	54	2	Pharm. Zentralh., 1914, v. 55, p. 438.
Hortvet, Julius	33	3	Rep. Minnesota D. & F. Com., 1914, p. 47.
Mansfeld, M.	11	2	Ztschr. Allgem. österr. Apoth.-Ztg., 1914, v. 68, p. 524.
Stadtmueller, F. H.	2	1	Rep. Connecticut D. & F. Com., 1914, p. 15.
Street, John Phillips	2	1	Rep. Connecticut Agric. Exper. Sta., 1914, p. 333.

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For additional references on honey see: Chem. Abstr.; Exper. Sta. Rec.; Ztschr. unters. Nahr. u. Genussm.; Chem. Zentralbl.; J. Chem. Soc. Lond.

MENTHA PIPERITA.

U. S. P. IX: Leaves more or less crumpled and frequently detached from the stems, stems quadrangular. Qualitative test for menthol added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 390, and Abstr. Prop. Changes, Part 2, 1914, p. 32.

Gattefossé, R. M.: French peppermint. The adoption of English plants and methods of rectification.—Perf. & Ess. Oil Rec. 1914, v. 5. p. 7.

Anon.: The Japanese mint industry. An illustrated review.—Chem. & Drug. 1914, v. 84, p. 213.

Baker, W. L.: Mentha piperita was found to be inferior both in color and odor.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Maines, E. L.: Peppermint herb was found to contain 12.24 to 13.07 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

J. D. Riedel, A.-G.: Peppermint contained from 10.2 to 12.7 per cent of ash and from 38.7 to 45.1 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

U. S. P. IX: Directions for making the spirit modified. Provide for the preliminary maceration of the leaves in water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 527, and Abstr. Prop. Changes, Part 3, 1914, p. 4.

Frary, Guy G.: The results on spirit of peppermint show an improved condition here and the exercise of more care on the part of druggists in making this simple preparation.—Rep. South Dakota F. & D. Com. 1914, p. 255.

Caspari, Charles, jr.: Spirit of peppermint, which the Pharmacopœia requires to contain 10 per cent by volume of oil in alcoholic solution, has been found to contain 1.5, 2, and 3 per cent, and it is sold in drug stores in bottles bearing a label giving the dose.—Proc. Maryland Pharm. Assoc. 1914, p. 72.

Williams, Ed. E.: The variation in color of essence of peppermint may be remedied by extracting the herb with water until all red color is exhausted from it. Then dry and use for coloring the essence as directed by the U. S. P.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

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Table showing some of the analytical results reported for spirit of peppermint.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	3	2	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, L. A.	10	8	Proc. Kentucky Pharm. Assoc. 1914, p. 118.
Brown, Lucius P.	2	1	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Congdon, Leon A.	12	10	Rep. Kansas Bd. Health, 1914, p. 100.
Frary, Guy G.	76	42	Rep. South Dakota F. & D. Com. 1914, p. 226, 257, 338.
Hortvet, Julius.	92	35	Rep. Minnesota D. & F. Com. 1914, p. 57.
Jaffa, M. E.	7	1	Rep. California Bd. Health (1910–1912), Sacramento, 1913, p. 297.
Lythgoe, Hermann C.	10	1	Bull. Massachusetts Bd. Health, 1914, v. 9, p. 243.
Newcomb, Geo. D.	7	5	Proc. Iowa Pharm. Assoc. 1914, p. 28.
Sayre, L. E.	3	1	Bull. Kansas Bd. Health, 1914, v. 10, p. 25.
Strode, Sylvanus E.	2	1	Rep. Ohio D. & F. Div. 1914, p. 119.
Todd, A. R.	46	31	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R.	56	29	Bull. Michigan D. & F. Dept. 1914, January-February, p. 17; March-April, p. 19; July-August, p. 26; September-October, p. 16; November-December, p. 22.
Wiedemann, H. E.	44	25	Rep. Missouri F. & D. Com. 1914, p. 29–30.
Woods, Chas. D.	106	72	Off. Insp. Maine Agric. Exper. Sta. 1914, No. 61, p. 94–95.

MENTHOL.

Thoms, H.: The production of menthol in Germany and in the German colonies, with a table showing the physical and chemical constants of the material obtained.—Arb. pharm. Inst. Univ. Berl. 1914, p. 57.

Anon.: The Japanese mint industry. An illustrated review.—Chem. & Drug. 1914, v. 84, p. 213.

Mann, H.: The use of menthol in perfumery and cosmetics.—Spatula, 1914, v. 21, p. 84–85.

Editorial: A review of the conditions existing in the menthol market, with a report of the exports of menthol and mint oil from Japan for the years 1911 to 1913.—Chem. & Drug. 1914, v. 84, p. 180–181. See also p. 212, and Oil, Paint & Drug Rep. 1914, v. 85, February 2, p. 9.

Schimmel & Co.: The melting point of official menthol should be required to be from 42 to 44°.—Semi-Ann. Rep. April, 1914, p. 105–106. See also Südd. Apoth.-Ztg. 1914, v. 54, p. 272.

Dück: Menthol was found to have a peculiar foreign odor and to melt at from 36° to 37°.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 235.

Anon.: The congealing point of menthol and of oil of fennel is a more readily demonstrated factor than is the melting point. Menthol congeals at from 40° to 41°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 272.

Nixon, C. F.: A modified formula for compound menthol spray.—Apothecary, 1914, January, v. 26, p. 20.

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Berliner: The treatment of pneumonia, pleuritis, and bronchitis with menthol and eucalyptol.—Deutsch. med. Wchnschr. 1914, v. 40, p. 2100.

METHYLIS SALICYLAS.

U. S. P. IX: General article under methyl salicylate to replace the present U. S. P. VIII text for the oil of sweet birch, oil of gaultheria, and methyl salicylate, includes the requirement that the source from which the product is derived in every case must be stated on the label.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1104, and Abstr. Prop. Changes, Part 5, 1914, p. 5.

Anon.: The Ph. Brit. V methyl salicylas or synthetic oil of wintergreen contains not less than 98 per cent of pure methyl salicylate.—Chem. & Drug. 1914, v. 85, p. 487.

Watson and Sayre: Oil of birch and methyl salicylate. Some new color reactions for the differentiation of oil of wintergreen.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1658–1659.

Editorial: The detection of added methyl salicylate by the test alleged to have been introduced by the United States Government.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 4–5. See also J. Am. Pharm. Assoc. 1914, v. 3, p. 556–557, and Schimmel & Co.: Semi-Ann. Rep. 1914, April, p. 98–99.

Murray, B. L.: The Department of Agriculture has apparently succeeded in devising a test by which oil of gaultheria, oil of betula, and synthetic methyl salicylate may be distinguished from each other and mixtures of them can be detected.—Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Patch, E. L.: Many lots of oil of birch have been condemned as mixtures of methyl salicylate and other distillates. A partial application of the new test shows its value to be at least doubtful.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1284–1286.

Latham, Thomas: A formula for analgesic liquid balm containing methyl salicylate, menthol, hydrous lanolin, and water is highly recommended as yielding a preparation which gives good satisfaction.—J. Am. Pharm. Assoc. 1914, v. 3, p. 237.

Hanzlik, Paul J.: The salicylates. A historical and critical review of the literature.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 131–189.

METHYLTHIONINÆ HYDROCHLORIDUM.

Roberts, J. G.: The presence of zinc salts was found in two samples of methylene blue. They also yielded 3.8 per cent and 7.1 per cent. respectively, as ash.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Stockinger, R.: The three samples of methylene blue examined all yielded more residue upon ignition than the 0.008 gm. per 2 gm. sam-

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ple allowed by the U. S. P. One of the residues contained copper, iron, and zinc.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Francis, Thomas: Nitric acid will remove the stains of methylene blue from mortar, pestle, spatula, etc.—Bull. Pharm. 1914, v. 28, p. 296.

MISTURÆ.

Curry, Gordon L.: The four official mixtures are all familiar to the dispenser and should be made extemporaneously.—Proc. Kentucky Pharm. Assoc. 1914, p. 58.

Mistura Glycyrrhizæ Co.—Williams, Ed. E.: In making compound mixture of glycyrrhiza, heat the extract with water in a covered evaporating dish on a water bath. This greatly facilitates the solution and shortens the time of manufacture.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Congdon, Leon A.: One sample of Brown's mixture; not standard.—Rep. Kansas Bd. Health, 1914, p. 100.

Mixture Rhei et Sodæ.—Williams, Ed. E.: Mixture of rhubarb and soda, U. S. P., and mixture of rhubarb compound, N. F., are nearly identical preparations—one is about one-third stronger than the other. One of these is superfluous and should be dismissed.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Salicylated mixture of iron.—Amos, W. S.: Salicylated mixture of iron may have a local use somewhere, but does not appear to be of sufficient importance to justify their inclusion in the N. F.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

MORPHINA.

Anon.: The discovery of morphine. A review of the experimental work which lead to the discovery of morphine by Serturner.—Montreal Pharm. J. 1914, v. 25, p. 73–75.

Mossler, Gustav: A report of experiments on the production of opium alkaloids from the capsules.—Pharm. Post, 1914, v. 47, p. 483–486; also Pharm. Ztg. 1914, v. 59, p. 600, and Pharm. J. 1914, v. 93, p. 525.

Wilbert, M. I.: A table showing the quantities of the several narcotic drugs entered for consumption in the United States during the years 1910–1913.—Public Health Rep. 1914, v. 29, p. 3180–3183.

Marden and Elliott: Morphine and its salts can not readily be extracted in aqueous solution because of their insolubility in most aqueous solvents. Experimental results with a variety of solvents are reported.—J. Ind. & Eng. Chem. 1914, v. 6, p. 931–933.

von Braun, J.: Examination of the morphine alkaloids. The chemical formula of morphine, codeine, and thebaine, with a report

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of some experiments.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2312–2330.

Einbreck, Hans: Progress in the chemistry of the morphine alkaloids.—Fortschr. Chem. 1914, v. 9, p. 193.

Gaell and Marschalké: The quantitative determination of several opium alkaloids, on the basis of their conversion into their methyloxyl group.—Ztschr. Anal. Chem. 1914, v. 53, p. 673–678.

Gordin and Kaplan: Notes on the estimation of morphine and on Lloyd's reagent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1636–1658; also Merck's Rep. 1914, v. 23, p. 295–296, and Am. J. Pharm. 1914, v. 86, p. 461–464.

Fernau, Albert: The Ph. Austr. should include the color reaction, with solution of formaldehyde and sulphuric acid.—Ztschr. Allgem. österr. Apoth.-Ztg. 1914, v. 52, p. 563.

Oliver, T. H.: The copper test for morphine was first suggested by Denigès about 1910.—Lancet, 1914, v. 187, p. 423; also Drug Topics, 1914, v. 29, p. 132.

Williams, J. B.: The estimation of morphine in pills and tablets.—Am. J. Pharm. 1914, v. 86, p. 308–312.

Brown, Linwood, A.: The determination of morphine in tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 642–643. See also Kebler, L. F., p. 1093.

Finneran, J. F.: Examination of samples of tablets of one-sixth grain morphine showed that the tablets contained one-fourth grain.—Proc. Maine Pharm. Assoc. 1914, p. 43.

Deussen, Ernst: The sterilization of solutions of morphine, the changes produced and the need for using boiled recently distilled water.—Münch. med. Wchnschr. 1914, v. 61, p. 2339–2340. See also Pharm. Post, 1914, v. 47, p. 93.

Grimbert and Leclére: The determination of oxy-morphine in presence of morphine.—J. pharm. et chim. 1914, v. 10, p. 425–428.

Aloy and Rabaut: The characterization of morphine and of phenols by means of the salts of uranium.—Bull. Soc. chim. France, 1914, v. 15, p. 680–682.

Jackson, D. E.: A note on the pharmacological action of opium alkaloids.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 57–72.

Meissner, R.: A reply to Straub's remarks on the work relating to the influence of morphine action on the secondary alkaloids of opium.—Biochem. Ztschr. 1914, v. 67, p. 502–503.

Pitini, A.: Pharmacological research on several derivatives of morphine and of codeine.—Ann. chim. applicata, 1914, v. 2, p. 208–213.

Bertrand, Gabriel: On the use in obstetrics and in surgery of large doses of morphine as an analgesic.—Bull. sc. pharmacol. 1914, v. 21, p. 497–501.

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Rongy and Arluck: The use of scopolamine-morphine in labor. A preliminary report based upon a study of 100 cases, with a detailed report of every tenth case.—New York M. J. 1914, v. 100, p. 619–621. See also Editorial: p. 629–630, and Heller, Jacob: Med. Rec. 1914, v. 86, p. 797–799.

Editorial: The use of twilight sleep in obstetrics. Unbiased opinion seems to be that the routine use of scopolamine-morphine injection in general medical work would increase the dangers to both the mother and child.—Hahnemann. Month. 1014, v. 49, p. 946–947.

Kochmann, M.: The use of morphine and related compounds for relieving pain.—Therap. Monatsh. 1914, v. 28, p. 649.

Wolff, Herbert: A study of the synergism existing between morphine, urethane, and other narcotics.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 298–310.

Delava, Paul: An experimental study of the ocular compression effects after the administration of morphine and other drugs.—Compt. rend. Soc. biol. 1914, v. 76, p. 631–632.

Reach, Felix: A contribution on chronic morphine action.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 321–326.

Anderson, W. K.: Morphinomania. Report of a case of two years' standing.—Practitioner, 1914, v. 92, p. 440–443.

Valenti, Adriano: Experimental observations on chronic morphinism.—Arch. exper. Path. u. Pharmakol. 1914, v. 75, p, 437–462.

König, H.: The prognosis of morphinism. A review of the varied courses that disease may take.—Berl. klin. Wchnschr. 1914, v. 51, p. 1061–1064.

Mignot and Usse: Mental disturbances observed in subjects addicted to the use of morphine and to the use of chloral.—(L'Encéphale, 1913, March) Nouv. remèdes, 1914, v. 31, p. 96.

Valenti, Adriano: On the elimination of morphine in the gastrointestinal tract. Report of experimental work.—Arch. farmacol. sper. 1914, v. 17, p. 248–262.

Czapek and Wassermann: Acute suppression of urine, an infrequently noticed action of morphine.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1567–1569.

van Rijn, W.: Fatal case of morphine poisoning and a report of chemical, physical, and physiological detection of morphine.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 762–767.

Jolliffe, R. C.: Death of a foal 2 days old following hypodermic administration of one-half grain morphine. It is said to be practically impossible to kill an adult horse with morphine.—Am. Vet. Rev. 1914, v. 45, p. 465–467.

Anon.: The protocol of the International Opium Convention, including a list of the countries that have signified adherence to the pro-

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visions of the protocol.—Rev. Internat. Pharm. Brux. 1914, v. 2, p. 4–7.

Anon.: A list of the alkaloids, derivatives, and preparations for which official order blanks will be required in New York under the Boylan law.—Drug. Topics, 1914, v. 29, p. 104–105.

For additional references on morphine see Chem. Abstr.; Chem. Zentralbl.; Zentralbl. Physiol.; Jahresber. Pharm.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

MORPHINÆ HYDROCHLORIDUM.

Kollo, Konstantin: Ampoules of morphine hydrochloride may be Tyndallized at 100° for one-half hour.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

MORPHINÆ SULPHAS.

Brown, L. A.: A total of 13 samples of tablets of morphine sulphate were analyzed; 5 passed and 8 adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Todd, A. R.: Of 12 samples of tablet triturates of morphine sulphate examined 1 was found to be adulterated.—Rep. Michigan D. & F. Com. 1914, p. 176.

MOSCHUS.

U. S. P. IX: Known in commerce as Tonquin or Tibetan musk. Description somewhat elaborated. Musk, when dried to constant weight in a desiccator over sulphuric acid, should not lose more than 15 per cent of moisture.—J. Am. Pharm. Assoc. 1914, v. 3, p. 391, and Abstr. Prop. Changes, Part 2, 1914, p. 33.

Hayes, Benjamin A.: The origin of Tonquin musk and its uses in perfumery.—Pract. Drug. 1914, v. 32, p. 557.

Tunmann, O.: Musk is imported directly into Hamburg from Shanghai, only negligible quantities coming by way of England.—Apoth.-Ztg. 1914, v. 29, p. 101.

Roure-Bertrand Fils: A table showing the statistics of exports of musk since 1908.—Sc. & Ind. Bull. April, 1914, p. 66. See also Schimmel & Co.: Semi-Ann. Rep. April, 1914, p. 106, and Gehe & Co.: Handelsbericht, 1914, p. 95.

Anon.: Musk, although largely used for other purposes, is now seldom prescribed as a medicine.—Lancet, 1914, v. 187, p. 907.

MYRISTICA.

U. S. P. IX: Description elaborated. Broken and wormy kernels should be rejected. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 391, and Abstr. Prop. Changes, Part 2, 1914, p. 33.

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Anon.: Nutmegs and mace, their history, botany, and cultivation. Illustrated by plantation photographs.—Chem. & Drug. 1914, v. 84, p. 160–162. See also p. 392.

Maines, E. L.: Nutmeg was found to contain from 1.83 to 2.63 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Rippetoe, J. R.: One sample of nutmeg was found to contain 14.35 per cent of alcohol extract and 2 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

J. D. Riedel, A.-G.: Myristica contained from 2.3 to 3.3 per cent of ash and from 37.2 to 41.2 per cent of extract soluble in ether.—Riedel's Berichte, 1914, p. 33.

Hortvet, Julius: Of 10 samples of nutmeg examined, 4 were reported illegal.—Rep. Minnesota D. & F. Com. 1914, p. 68.

Anon.: Two cases of severe, not fatal, poisoning in young women from the ingestion of an infusion of nutmeg.—Südd. Apoth.-Ztg. 1914, v. 54, p. 347.

MYRRHA.

U. S. P. IX: A gum resin obtained from one or more species of *Commiphora*. Powder described in detail. Not less than 35 per cent of myrhh should be soluble in alcohol. Ash not exceeding 8.5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 392, and Abstr. Prop. Changes, Part 2, 1914, p. 34.

Caesar & Loretz: The determination of resin content of resins and gum resins.—Jahres-Ber. 1914, p. 87–88.

Baker, W. L.: The ash content of Po. Gum. Myrrh was found to be high, 15 per cent.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 210.

Maines, E. L.: Myrrh gum was found to contain from 4.08 to 5.45 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

E'we, G. E.: Three lots of powdered myrrh tested 27.7, 33.2, and 36.2 per cent, respectively, of alcohol-soluble matter. Two of the lots gave ash yields of 28.5 and 8 per cent, respectively.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Rippetoe, J. R.: Three sampes of myrrh were found to contain from 10.99 to 26 per cent of alcohol extract and from 7.70 to 11.28 per cent of ash. One sample was of poor quality.—Am. J. Pharm. 1914, v. 86, p. 441.

Mann, E. W.: The ash yield from three samples of powdered myrrh ranged from 3.37 to 4.74 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 18.

Linke, H.: Six samples of myrrh gave from 2.50 to 4.8 per cent of ash.—Apoth.-Ztg. 1914, v. 29, p. 567.

Lefeldt, M.: The Ph. Germ. V should include a requirement for alcohol soluble constituents in tincture of myrrh.—Pharm. Ztg. 1914, v. 59, p. 43.

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NAPHTHALENUM.

Storp, W.: On the combustibility of naphthalene.—Pharm. Ztg. 1914, v. 59, p. 653–654.

Fronsac, Lucien: The determination of naphthalene in the control and purification of illuminating gas.—Rev. gén. chim. 1914, v. 17, p. 4–8.

Bacot, A. W.: Naphthalene for the destruction of mosquitoes in covered cisterns and wells, with tabulated summary of results.—Brit. M. J. 1914, v. 2, p. 15.

Collins and Hall: The use of coal tar, creosote, and naphthalene for preserving wooden fences.—J. Soc. Chem. Ind. 1914, v. 33, p. 466–468.

For additional references on naphthalene see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

NITROUS OXIDE.

U. S. P. IX: Nitrous oxide (N_2O). A colorless gas, possessing a slight characteristic odor and a somewhat sweetish taste. Tests for carbon dioxide, halogens, acids or bases, and reduced substances are added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1572–1573, and Abstr. Prop. Changes, Part 6, 1914, p. 10–11.

Torley and Matter: Process for the manufacture of nitrous oxide. U. S. Patent 1,098,305, May 26, 1914.—J. Soc. Chem. Ind. 1914, v. 33, p. 750.

Coburn, R. C.: Sterilization of apparatus for nitrous oxide-oxygen anesthesia.—J. Am. M. Assoc. 1914, v. 63, p. 1596.

Moorhead, S. W.: An illustrated description of a portable nitrous oxide-oxygen apparatus.—J. Am. M. Assoc. 1914, v. 62, p. 1326. See also Miller, Albert H.: v. 63, p. 1474–1475.

Guy, G.: For prolonged dental operations nitrous oxide and ether, in mixture or sequence, is of proved value.—Dental Cosmos, 1914, v. 56, p. 1295. See also p. 1296, and Macfarlane, W. I.: Dental Digest, 1914, v. 20, p. 16–19.

Frederick, H. B.: Nitrous oxide and oxygen anesthesia.—Electic M. J. 1914, v. 74, p. 580–581.

Miller, R. P.: We have as yet found no ideal anesthetic toward which we are striving, but we have in nitrous oxide and oxygen the safest and best anesthetic known to-day.—J. Am. Inst. Homœop. 1914, v. 6, p. 733–736.

Dolley, David H.: A note on nitrous oxide as an anesthetic in animal experimentation.—J. Exper. M. 1914, v. 19, p. 372–375.

For additional references see Index Med.; Zentralbl. exper. Med.; J. Am. M. Assoc.; Chem. Abstr.; and Chem. Zentralbl.

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NUX VOMICA.

U. S. P. IX: Description elaborated. Color test for potassium dichromate and sulphuric acid omitted. Ash not exceeding 3.5 per cent. To require not less than 2.5 per cent of the total alkaloids of nux vomica.—J. Am. Pharm. Assoc. 1914, v. 3, p. 392, 994, and Abstr. Prop. Changes, Part 2, 1914, p. 34, Part 4, p. 11.

Mann, E. W.: Nux vomica, in the Ph. Brit. V, is required to contain a minimum of 1.25 per cent of strychnine. A sample of powder drawn from a considerable bulk and assayed by the official method yielded 1.34 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 18.

Lloyd, John Uri: Characteristics and constituents of nux vomica.—Eclectic M. J. 1914, v. 74, p. 227.

Editorial: The scarcity of nux vomica. Review of the recent fluctuation in the price of the drug.—Pharm. J. 1914, p. 842–843.

Baker, W. L.: In a sample of nux vomica, the physical appearance of the seeds was poor; strychnine content 1.222 per cent.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Gehe & Co.: A new variety of nux vomica is being brought into the market by way of Burma. The seeds externally are light gray and internally yellow. They are devoid of strychnine. The origin of this false nux vomica has as yet not been discovered.—Handelsbericht, 1914, p. 119.

Weinstein, Joseph: Nux vomica is hard to find that will assay U. S. P. amount of alkaloid.—Proc. New York Pharm. Assoc. 1914, p. 114.

Wassicky, R.: The microchemical detection of strychnine and brucine in the seeds of strychnos nux vomica.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 35, 42, 53, 67.

Schaefer, Hugo H.: Notes on a new alkaloid found in nux vomica. The name "struxine" is proposed for the compound.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1677–1681.

Maines, E. L.: Nux vomica was found to contain from 1.57 to 2.39 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

J. D. Riedel, A.-G.: Nux vomica contained from 1.6 to 2.8 per cent of ash, and from 14.2 to 17.1 per cent of extract soluble in diluted (70 per cent alcohol).—Riedel's Berichte, 1914, p. 33.

Ramsay, C. F.: Nux vomica contains about 11 per cent proteid, 6 per cent of sugar, and gum, which accounts for the difficulty in extracting it.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1648.

E'we and Vanderkleed: Proportion of strychnine in total alkaloids of nux vomica.—Proc. Pennsylvania Pharm Assoc. 1914, p. 277.

Caesar & Loretz: The valuation of nux vomica, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 111–112.

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Dichgans, H.: A comparative review of the assay processes included in the several pharmacopœias for nux vomica and its preparations. All pharmacopœias with the single exception of the U. S. P. require a total alkaloid content of 2.5 per cent.—Apoth.-Ztg. 1914, v. 29, p. 293, 306, 330, 342, 357.

Linke, H.: The Ph. Germ. V method of assay for nux vomica is time consuming, while the Fromme method can be carried out within two and one-half hours.—Apoth.-Ztg. 1914, v. 29, p. 673.

E'we and Vanderkleed: Note on the U. S. P. assay of nux vomica for strychnine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1682.

Azadain, M.: A method for determining total alkaloid in nux vomica which involves precipitation by means of silicotungstic acid.—Pharm. J. 1914, v. 93, p. 371.

Dott, D. B.: Estimation of strychnine in presence of brucine.—Pharm. J. 1914, v. 93, p. 120; also Year-Book of Pharmacy, 1914, p. 331–332.

Cowie, W. B.: Assay of nux vomica. The reason for variations obtained with the British Pharmacopœia IV process.—Pharm. J. 1914, v. 92, p. 545.

Dichgans, H.: The summary of the results obtained in an experimental review of the several official assay methods for nux vomica. The results obtained with the same material varied from 1 to 3.342 per cent of alkaloid. The Keller-Fromme method was found to give the most satisfactory results.—Apoth.-Ztg. 1914, v. 29, p. 330–331. See also Caesar & Loretz: Jahres-Ber. 1914, p. 27.

Roberts, J. G.: Only 1 of the 10 samples of nux vomica examined responded to the U. S. P. requirement of not less than 1.25 per cent strychnine. The strychnine content of the other 9 samples ranged from 0.923 to 1.23 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Caesar & Loretz: Nine samples of nux vomica were found to contain from 2.39 to 2.87 per cent of total alkaloid.—Jahres-Ber. 1914, p. 40.

Vanderkleed, C. E.: Reports 18 assays of nux vomica, from 0.46 to 1.33 per cent of strychnine; 2 above and 16 below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

U. S. P. IX: One gm. of the powdered extract to represent 4 gm. of the drug. A mixture of alcohol 3 volumes and water 1 volume to be used as a menstruum. Fixed oils to be removed by petroleum benzin. Magnesium oxide and dried starch to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 536, and Abstr. Proc. Changes, Part 3, 1914, p. 13.

Todd, A. R.: Of six samples of fluid extract of nux vomica examined, one was found adulterated. Rep. Michigan D. & F. Com. 1914, p. 176.

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U. S. P. IX: To require that the tincture of nux vomica yield not less than 0.237 nor more than 0.263 gm. of the total alkaloids of nux vomica.—J. Am. Pharm. Assoc. 1914, v. 3, p. 994, and Abstr. Prop. Changes, Part 4, 1914, p. 11.

Mittelbach, Wm.: The method for making tincture of nux vomica will be changed to direct percolation of the powdered drug.—Proc. Missouri Pharm. Assoc. 1914, p. 107.

Becker, L. A.: The present U. S. P. process for tincture of nux vomica insures a more reliable preparation with the skill required for its manufacture than making the tincture from the drug.—Nat. Druggist, 1914, v. 44, p. 419.

Brown, L. A.: Twenty-four samples analyzed; 12 passed and 12 found adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 117.

Street, John Phillips: Forty samples of tincture of nux vomica contained from 0.082 to 0.105 gm. strychnine per 100 cc. Only two were notably deficient.—Rep. Connecticut Agric. Exper. Sta. 1914, p. 335.

Todd, A. R.: Of two samples of tincture of nux vomica examined, one was found to be adulterated.—Rep. Michigan D. & F. Com. 1914, p. 176.

Stadtmueller, Frank H.: Of 39 samples of tincture of nux vomica examined, 2 were found to be below standard.—Rep. Connecticut D. & F. Com. 1914, p. 15.

Finnemore and Williamson: The incompatibility of strychnine and nux vomica with alkalies, iodides, and bromides.—Pharm. J. 1914, v. 92, p. 124–125. For discussion see p. 153; also Year-Book of Pharmacy, 1914, p. 346–351 and p. 351–355, and Merck's Rep. 1914, v. 23, p. 242–243.

Yanmann, C. F.: Nux vomica in gastrointestinal disorders.—Eclectic M. J. 1914, v. 74, p. 351–352.

Massey, R. E.: In certain cases, properly used, nux vomica is an excellent remedy.—Ellingwood's Therap. 1914, v. 8, p. 136.

OLEORESINA.

Mittelbach, Wm.: In the U. S. P. IX ether will again be used in making oleoresin. This is a good step, especially so as the price of ether is much lower than at the time acetone was adopted as the solvent.—Proc. Missouri Pharm. Assoc. 1914, p. 107.

OLEA PINGUA.

Mann, E. W.: In the Ph. Brit. V monographs for fixed oils the characters and tests are greatly modified.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 5. See also Heebner, Chas. F.: Canadian Pharm. J. 1914, v. 48, p. 206.

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Editorial: The characters now given in the Ph. Brit. V for fats and oils include in nearly all cases the acid value, saponification value, iodine value, and refractive index, besides the specific gravity which is usually given at present.—Brit. M. J. 1914, v. 2, p. 759; also Editorial: Chem. & Drug. 1914, v. 84, p. 480.

Anon.: The Ph. Brit. V requirements for fixed oils, fats, and waxes are presented in the form of a table.—Chem. & Drug. 1914, v. 85, p. 489; also Perf. & Ess. Oil Rec. 1914, v. 5, p. 380–381.

Lefeldt, M.: The Ph. Germ. V directions for determining the acid number of fatty oils should be made more definite.—Pharm. Ztg. 1914, v. 59, p. 42.

Fernau, Albert: In connection with fats and fatty oils the Ph. Austr. should include additional physical and chemical constants, such as congealing point and acid number.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 263.

Harting and van Dongen: The congealing point of fats and oils.—Pharm. Weekblad, 1914, v. 51, p. 1415–1418; also Apoth.-Ztg. 1914, v. 29, p. 950.

Twitchell, E.: The melting and solidifying points of mixtures of fatty acids and the use of these points to determine the composition of such mixtures.—J. Ind. & Eng. Chem. 1914, v. 6, p. 564–569.

Bömer, A.: Contributions to our knowledge of the glycerides of fats and oils. The application of melting point difference in fat analysis.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 27, p. 153–172.

Jensen, H. R.: Table showing the specific gravity, refractive index, saponification value, iodine value, acid value, and special values of fixed oils, fats, and waxes.—Evans' An. Notes, 1914, p. 76–78.

Richter, R.: The acid number of oils, with a table showing the variation in the acid number of a number of fatty oils when determined by different methods.—Pharm. Ztg. 1914, v. 59, p. 233.

Marcille, R.: The Hübl iodine number of essential oils and the determination of this number in alcoholic solutions.—Compt. rend. Acad. sc. 1914, v. 159, p. 1004–1007.

Weiser and Donáth: A critical experimental study on the several methods of determining the iodine number of fats.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 65–73.

Meigner and Winogradoff: Observations on the action of halogens on oleic acid and the determination of the iodine number of fats.—Apoth.-Ztg. 1914, v. 29, p. 462.

Gemmell, Alexander: The insoluble bromide value of oils and its determination.—Pharm. J. 1914, v. 92, p. 816; also Analyst, 1914, v. 39, p. 297–308.

Holland, Edward B.: The determination of the acetyl number of oils and fats.—J. Ind. & Eng. Chem. 1914, v. 6, p. 482–486.

Digitized by Google

Vignon, Leo: The solvents for oils. The action of the several solvents.—Bull. soc. chim. France, 1914, v. 15, p. 540–544.

Stokes, G. A.: An illustrated description of a simple fat extractor.—Analyst, 1914, v. 39, p. 295–296.

Kremann and Kropsch: A contribution to the knowledge of natural fats from the standpoint of phase rule.—Monatsh. Chem. 1914, v. 35, p. 561–580. See also p. 823–839, and 841–857.

Schmitz, Ed.: The use of superheated steam in the fat industry.—Chem.-Ztg. 1914, v. 38, p. 1163.

Prescher, Johannes: Observations on the distillation of volatile fatty acids and the Reichert-Meissl number value.—Chem.-Ztg. 1914, v. 38, p. 1081–1082, 1091–1093.

Klostermann and Opitz: Phytostearin and its determination in vegetable fats.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 138–145.

Salomon, Hans: The determination of the unsaponifiable constituents of the official oils and fats and of lanolin by the digitonin method.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 189–193.

Berg and Angerhausen: The separation of stearin from fats by means of digitonin.—Chem.-Ztg. 1914, v. 38, p. 978–979.

Olig, A.: The Bömer method for the detection of phytostearin. A modification of the Marcusson-Schilling digitonin precipitation method.—Ztschr, unters. Nahr. u. Genussm. 1914, v. 28, p. 129-138.

Kühn and Wewerinke: The determination of phytostearin by means of digitonin.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 369–379.

Narnes, G.: Use of digitonin in Bömer's method of fat analysis.—Svensk Kem. Tidskr. 1914, v. 26, p. 68–71. See also Lundberg, Thure: p. 148–150.

Berg and Angerhausen: The optical behavior of the stearin-free unsaponifiable residue of fats.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 145–149.

Szalágyi, K.: The refraction and dispersion determinations on fats and oils, with a table showing the results obtained.—Biochem. Ztschr. 1914, v. 66, p. 149–153.

Wingard, Ake: Autoxidation and the changes in physical characteristics of fatty oils.—Svensk farm. Tidskr. 1914, v. 18, p. 265–270, 281–287.

Sutherland, E. C.: Chemical methods for the purification of fats and oils. Outline of the several methods employed.—Chem. Weekblad, 1914, v. 11, p. 344–348.

Strevens, J. L.: The viscosity of oils.—J. Soc. Chem. Ind. 1914, v. 33, pp. 109–111.

Molin, Einar: A simple method for the determination of the degree of viscosity of mixtures of mineral oil.—Chem.-Ztg. 1914, v. 38, p. 857–859.

Digitized by Google

Marcelin, André: The limit of extension of film of oil on water.—Ann. Phys. Paris, 1914, v. 1, p. 20.

Rittman, Walter F.: The theoretical problems involved in the cracking of oils.—J. Soc. Chem. Ind. 1914, v. 33, p. 626–628.

Sisley and Frehse: The action of dinitro derivatives on vegetable oils.—Bull. Soc. chim. France, 1914, v. 15, p. 295–298.

Marcusson and Meyerheim: The unsaponifiable constituents of natural and of hardened fats.—Ztschr. ang. Chem. 1914, v. 27, p. 201–203.

Bergius, F.: The hardening of fats.—Ztschr. ang. Chem. 1914. v. 27, p. 513–517. See also p. 522–525; also Pharm. Post, 1914, v. 47, p. 424, and Südd. Apoth.-Ztg. 1914, v. 54, p. 496–497.

Crossley, A.-W.: On the transformation of oils and solid fats by means of hydrogen.—J. pharm. et chim. 1914, v. 10, p. 337–343.

Thompson, Erwin W.: Artificially hardened oils in competition with copra oil.—Am. Perf. 1914, v. 9, p. 139.

Lehmann, K. B.: The utilization of hardened oil for human consumption.—Chem.-Ztg. 1914, v. 38, p. 798–799.

Thoms and Müller: Observations on the use of hydrogenated fats as food, including a review of the production and properties of hydrogenated fats.—Arb. pharm. Inst. Univ. Berl. 1914, p. 137–156. See also Nussbaum: Schweiz.-Ztg. 1914, v. 52, p. 177.

Anon.: Oil-hardening plant in Norway; an abstract.—J. Ind. & Eng. Chem. 1914, v. 6, p. 165.

Ellis, Carleton: The analytical constants of hydrogenated oils.—J. Ind. & Eng. Chem. 1914, v. 6, p. 117–122. See also Oil, Paint & Drug Rep. 1914, v. 86, Oct. 26, p. 18–19.

Kerr, Robert H.: Note on the detection of nickel in fats.—J. Ind. & Eng. Chem. 1914, v. 6, p. 207; also Chem. Eng. 1914, v. 20, p. 12–13.

Fendler and Stüber: The detection and determination of small quantities of iodin in oils.—Ztschr. physiol. Chem. 1914, v. 89, p. 123–132.

Hervig, W.: Review of progress in the chemistry of fats, oils and waxes.—Chem. Rev. Fett u. Harz Ind. 1914, v. 21, p. 44–47, 75–78, 99–102, 132–134, 183–187, 207-208, 213–215, 219–222, 229–232.

Farr, E. H.: A review of recent work on fats and oils.—Pharm. J. 1914, v. 92, p. 118; also Chem. & Drug. 1914, v. 85, p. 163.

Brinsmaid, William: An illustrated description of apparatus for the determination of fat by the Roese-Gottlieb method.—J. Ind. & Eng. Chem. 1914, v. 6, p. 324–325.

Gill, A. H.: A book review of volume one of a work on chemical technology and analysis of oils, fats and waxes, by J. Lewkowitsch.—Science, 1914, v. 39, p. 760. See also Sherman, H. C.: J. Ind. & Eng. Chem. 1914, v. 6, p. 176, and Pharm. Era, 1914, v. 147, p. 548.

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For additional references on fatty oils see Chem. Abstr.; Chem. Zentralbl. Biochem. u. Biophys.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

OLEA VOLATILA.

U. S. P. IX: Proposed changes in connection with volatile oils.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1104–1110, and Abstr. Prop. Changes, Part 5, 1914, p. 5–11.

Anon.: The U. S. P. IX monographs for volatile oils have been subjected to thorough revision and have been brought up to date.—Chem. & Drug. 1914, v. 85, p. 400.

Editorial: The subject of volatile oils in the Pharmacopœia is causing considerable trouble. Some of these products vary to such an extent that the specific gravity test is practically worthless.—Bull. Pharm. 1914, v. 28, p. 135.

Remington, J. P.: Volatile oils as now on the market are manufactured products.—Proc. N. A. M. M. P. 1914, p. 33; also Am. Druggist, 1914, v. 62, p. 89, and Proc. Minnesota Pharm. Assoc. 1914, p. 89.

Turner, T. E.: For volatile oils, the Ph. Brit. V wherever possible specifies specific gravity, optical rotation, and refractive index.—Chem. & Drug. Australas. 1914, v. 24, p. 430. See also Editorial: Brit. M. J. 1914, v. 2, p. 759.

Anon.: The Ph. Brit. V monographs for essential oils are a great improvement over those of the B. P. 1898.—Chem. & Drug. 1914, v. 85, p. 488; also Am. Perf. 1914, v. 9, p. 237–238, and Canadian Pharm. J. 1914, v. 48, p. 206.

Anon.: A review of the essential oils of the Ph. Brit. V with a table giving the physical data for the several oils.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 376–379; also Editorial: Chem. & Drug. 1914, v. 85, p. 480.

Fernau, Albert: The Ph. Austr. tests for volatile oils should be modified and extended.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 263.

Jensen, H. R.: Table showing identification data for volatile oil constituents, including the formula, boiling point, specific gravity, refractive index, optical rotation, and the melting points of derivatives.—Evans' An. Notes, 1914, p. 84–90.

Irk, Karl: On the changes of specific gravity of volatile oils at higher temperatures, with tables showing specific gravities noted by various observers.—Pharm. Zentralh. 1914, v. 55, p. 831–837.

Geare, R. I.: Some wild volatile oil plants and a list of the volatile oils produced commercially in the United States.—Merck's Rep. 1914, v. 23, p. 28–30.

Digitized by Google

Bush, William A.: California as a source of supply of flavoring seeds and herbs for distillation purposes.—Am. Druggist, 1914, v. 62, p. 163.

Charabot, Eugene: Formation and distribution of odorous products in plants.—Merck's Rep. 1914, v. 23, p. 34.

Sweeny, Grace M.: The perfume trees of the Philippines.—Am. Druggist, 1914, v. 62, p. 58–60.

Gutkind, Felix: Spanish essential oils, with illustrations of methods of distilling spice oil and thyme oil and oil of rosemary.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 8.

Roth, Richard: Volatile oils should be accorded the coolest and darkest place available in the store. Southern Pharm. J. 1914, v. 6, p. 483.

Umney, J. C.: Classification of essential oils. A list of synthetic esters used for adulteration.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 9–17.

Haworth and Fyfe: Synthetic hydrocarbons allied to the terpenes.—J. Chem. Soc. Lond. 1914, v. 105, p. 1659–1671.

Rabak, Frank: Comparison of the physical properties of some official volatile oils, with special reference to the requirements of the U. S. P. 1910.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1670–1671.

Cerdeiras, J.: The use of vanillin-hydrochloric-acid reaction for the recognition of volatile oils, with a table showing the color reactions obtained.—Pharm. Zentralh. 1914, v. 55, p. 339–341.

Penniman and Randall: A rapid method for the determination of camphor and of certain essential oils when in solution in alcohol.—J. Ind. & Eng. Chem. 1914, v. 6, p. 926–928.

Béhal, A.: Observations on the analysis of volatile oils.—Bull. soc. chim. France, 1914, v. 15, p. 565–568.

Dodge, Francis D.: Notes on the analysis of some essential oils.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1664–1668.

Bennett, C. T.: The systematic study of essential oils. Comments on oils prepared by destructive distillation.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 17.

Niviere, Jean: The determination of the ethers in volatile oils.—Bull. soc. chim. France, 1914, v. 15, p. 677–680.

Anon.: The determination of volatile acids in essential oils, with an illustrated description of the apparatus used.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 116–118.

Irk, Karl: Observations on the changes in the refractive index in volatile oils by heat.—Pharm. Zentralh. 1914, v. 55, p. 789–793. See also Pharm. Zentralh. 1914, v. 55, p. 831–837.

Brewer, J. S.: By clever manipulation, the specific gravity, rotation, and other characteristics of oils could be so adjusted as to make many of them answer to most of the prescribed tests.—J. Am. Pharm. Assoc. 1914, v. 3, p. 605.

Digitized by Google

Brewer, J. S.: Some aromatic chemicals, including a review of the methods employed in the production of some of the synthetic oils and natural oils.—Proc. Minnesota Pharm. Assoc. 1914, p. 194–199.

Albright, Alan R.: The hydrogen number of some essential oils and essential-oil products.—J. Am. Chem. Soc. 1914, v. 36, p. 2188–2202; also abstract Perf. & Ess. Oil Rec. 1914, v. 5, p. 381.

Cohn, Georg: Contribution to our knowledge of organic odorous substances.—Pharm. Zentralh. 1914, v. 55, p. 735–747, 763–767.

Henderson and others: Contributions to the chemistry of terpenes.—J. Chem. Soc. Lond. 1914, v. 105, p. 1367–1372, 1710–1718.

Semmler and others: Contributions to our knowledge of volatile oils.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 384–389, 1029–1030, 1141–1153, 2068–2082, 2252–2259, 2433–2443, 2555–2561, 2687–2694.

Wallach, O.: A contribution to our knowledge of the terpenes and volatile oils.—Ann. Chem. 1914, v. 403, p. 73–105.

A book review of a compilation of results on terpene and camphor by O. Wallach.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 320.

A book review of volume 2, second edition, of the work on essential oils by Gildemeister and Hoffmann.—J. pharm. et chim. 1914, v. 9, p. 533; also Am. Druggist, 1914, v. 26, p. 133.

Reclaire, A.: Progress in the chemistry of volatile oils and perfumes.—Ztschr. ang. Chem. 1914, v. 27, p. 572–576, 577–584. See also Müller, W.: Fortschr. Chem. 1914, v. 10, p. 95–112.

Schimmel & Co.: Notes on scientific research in the domain of essential oils.—Semi-Ann. Rep. April, 1914, pp. 119–148.

Roure-Bertrand Fils: A review of recent publications on perfumes and essential oils.—Sc. & Ind. Bull. April, 1914, p. 71–75. See also p. 39–70.

Editorial: The relative permanence of essential oils, with a table showing the relative permanency of the odor of the more widely used oils.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 99–100.

Brittain, E. H. F.: An analysis of the constituents of 349 perfumes, and a table showing the number of times the several oils occurred in the 349 formulas analyzed.—Chem. & Drug. 1914, v. 85, p. 59–60.

Mann, H.: Perfumes for use in air purification.—Am. Perf. 1914, v. 9, p. 47–48.

Rippetoe and Wise: The preservative action of essential oils; an abstract.—Am. Perf. 1914, v. 9, p. 12–13.

Cochran and Perkins: The comparative values of some essential oils as preservatives of cane-sugar solution.—J. Ind. & Eng. Chem. 1914, v. 6, p. 304–306. See also 306–307.

Editorial: The action of certain oils upon the uterus. A review of the paper by Macht.—Therap. Gaz. 1914, v. 38, p. 30.

For additional references on volatile oils see Chem. Abstr.; Chem Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

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OLEUM ADIPIS.

E'we and Vanderkleed: The Halphen reaction for cottonseed oil in lard oil will readily detect 2 per cent. The reaction is best observed by comparison with a blank test on lard oil known to be free from cottonseed oil.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 275.

Hankey, William T.: Of 11 samples of lard oil examined, 3 were rejected. While pure, they were not what is known as winter-strained oils and therefore congealed at too high a temperature.—Proc. Ohio Pharm. Assoc. 1914, p. 46.

OLEUM AMYGDALÆ AMARÆ.

U. S. P. IX: To direct that volatile oil of bitter almonds be obtained from the ripe kernel of *Prunus amygdalus* Stokes, and from other kernels containing amygdalin. Source from which it is derived in every case to be stated on the label.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1105, and Abstr. Prop. Changes, Part 5, 1914, p. 6.

Kassner and Eckelmann: The oil and amygdalin content of the seed of *Prunus domestica* L.—Arch. Pharm. 1914, v. 252, p. 402–408.

Schimmel & Co.: Since the almost universal admission of synthetic chlorine-free bitter-almond oil, the genuine oil has been rather neglected.—Semi-Ann. Rep. April, 1914, p. 29.

Dodge, Francis D.: The detection of chlorine in benzaldehyde and oil of bitter almond by a modification of the combustion process.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1665–1666.

Jensen, H. R.: Eleven samples of volatile oil of almond were found to vary in specific gravity from 1.044 to 1.0515; in refractive index from 1.54 to 1.545.—Evans's An. Notes, 1914, p. 6.

OLEUM AMYGDALÆ EXPRESSUM.

Schimmel & Co.: The abnormal state of the sweet almond market has been due to the entire failure of the crop in Sicily, following a poor crop in 1912.—Semi-Ann. Rep. April, 1914, p. 103.

Allen and Brewis: The adulteration of expressed oil of almond. A review of the origin and properties of oil of almond, with comments on the adulterants used.—D.-A. Apoth.-Ztg. 1914, v. 35, p. 33–34.

Dück, —: A sample of oil of sweet almond proved on examination to be old, slightly rancid, and to contain free fatty acids.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 235.

E'we, G. E.: One sample of oil of sweet almond was a trifle low in saponification number, namely, 188.2 instead of minimum 191 required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 151.

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Lythgoe, Hermann C.: Eighteen samples of expressed oil of almond examined were all found to be genuine.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 410.

Mann, E. W.: The 13 samples of almond oil examined proved to be normal.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 6.

Jensen, H. R.: Forty-nine samples of expressed oil of almond were found to vary in specific gravity from 0.917 to 0.9195; in refractive index from 1.4717 to 1.4729; acid value from 1.2 to 6.1; iodine value from 93.7 to 100.6.—Evans' An. Notes, 1914, p. 6.

Osborne and Mendel: Report the failure of almond oil to restore or promote growth in the same way as does butter-fat, egg yolk fat, or cod liver oil.—J. Biol. Chem. 1914, v. 17, p. 408.

OLEUM ANISI.

U. S. P. IX: A volatile oil distilled from the ripe fruit of *Pimpinella anisum* Linné or from the ripe fruit of *Illicium anisatum* Linné, conforming in name to the plant from which it is derived. Specific gravity from 0.978 to 0.988 at 25°. Refractive index 1.544 to 1.560 at 20°. Optical rotation from +1 to −2° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1105, and Abstr. Prop. Changes, Part 5, 1914, p. 6.

Umney, J. C.: The oil of true anise from *Pimpinella anisum* is dearer than star anise oil, but much more preferred as a flavoring agent.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 12.

Anon.: The cultivation and commerce of star anise. Three qualities of star anise oil are recognized, the white, yellow, and red oil.—Südd. Apoth.-Ztg. 1914, v. 54, p. 313.

Chevalier, August: The star anise of Tonquin; a review.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 75–77. See also J. Agric. Trop. 1914, v. 14, p. 40–44, and Bull. sc. Pharmacol. 1914, v. 21, p. 138–143.

Editorial: Recent shipments of oil of anise were found to be practically free from leaf oil and to have a congealing point as high as 16.5 and melting point 18.5 or thereabouts.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 130.

Anon.: Observations on the differentiation between the fruits of *Illicium anisatum* Lour and *Illicium religosum* Sieb.—Pharm. Zentralh. 1914, v. 55, p. 187.

Noyes, C. R.: Oil of anise as it appears on the market is very crude and is exported in a lead-lined copper container in which it absorbs a considerable quantity of lead and copper. The pure oil may be procured at a not much higher price, but it will never be supplied unless its purity is insisted upon.—J. Am. Pharm. Assoc. 1914, v. 3, p. 855; also Proc. Minnesota Pharm. Assoc. 1914, p. 192.

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Editorial: There is a wide range of difference between the congealing and melting points of the oils of star anise of commerce at the present time.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 73.

Schimmel & Co.: It is reported that samples of oil of star anise are on the market which, while possessing the normal solubility, are partly abnormal in respect to their other properties and appear to be adulterated. Adulteration probably consists in the addition of fatty oil or mineral oils.—Semi-Ann. Rep. April, 1914, p. 93.

Finneran, J. F.: At the present time it is impossible to buy in Massachusetts or from any of the New York importers who sell essential oils U. S. P. oil of anise.—Proc. Maine Pharm. Assoc. 1914, p. 42.

Patch, E. L.: Lots of oil of anise answered all tests but that of optical rotation. The optical rotation varied from −3° to +9.05°; congealing point of three samples from 6° to 15.5°; specific gravity of two samples 0.9796 and 0.9768, respectively.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1288.

Albright, Alan R.: The hydrogen number of imitation anise oil was found to be 125.1; the per cent of active constituent 82.4; the theoretical per cent of active constituent 80 per cent. The hydrogen number of anethol was found to be 150.5.—J. Am. Chem. Soc. 1914, v. 36, p. 2202.

Editorial: An oil of anise congealing at over 15° would be considered as complying with the Ph. Brit. V requirements.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 398.

Mann, E. W.: Dextro-rotatory oil is now granted official recognition, a necessary change since we usually find that more than one-half of the genuine samples examined possess a slight dextro-rotation.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 27.

Roberts, J. G.: All of the samples of oil of anise examined were of U. S. P. quality. They all contained a trace of lead, but the amount found in one of them was so small that it was considered negligible.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 148.

E'we, G. E.: One lot of oil of anise had a specific gravity of 0.980, optical rotation of −0.5°, and was strictly U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Congdon, Leon A.: Three samples of oil of anise; two not standard.—Rep. Kansas Bd. Health, 1914, p. 100. See also Sayre, L. E.: Bull. Kansas Bd. Health, 1914, v. 10, p. 24.

U. S. P. IX: To direct the use of recently boiled distilled water for anise water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, Part 3, 1914, p. 2.

Lythgoe, Hermann C.: Of 67 samples of spirit of anise examined, 15 were found to be adulterated and 52 genuine.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 410.

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Morin, E.: The iodine number of oil of anise may be used as a basis for determining the oil content of spirit of anise.—Ann. chim. anal. 1914, v. 20, p. 49–52.

Editorial: Manufacturing confectioners are still being supplied with most grossly adulterated star anise oil.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 278.

For additional references on anise oil see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

OLEUM AURANTII CORTICIS.

U. S. P. IX: Obtained by expression from the fresh peel of *Citrus aurantium sinensis* Gallesio and its varieties. Refractive index 1.4723 to 1.4737 at 20°. Dextrogyrate not less than 94°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1106, and Abstr. Prop. Changes, Part 5, 1914, p. 7.

Roure-Bertrand Fils: Tables showing the production and destination of Messina oranges during the years 1911, 1912, and 1913.—Sc. & Ind. Bull. April, 1914, p. 50.

Pattinson, J. W.: The orange-oil industry in Jamaica.—J. Jamaica Agric. Soc. 1914, v. 18, p. 113–115. See also Chem. & Drug. 1914, v. 85, p. 76, and Drug. Circ. 1914, v. 57, p. 665.

Patch, E. L.: Reports the specific gravity of oil of orange as 0.8458; optical rotation +89.5 (U. S. P. not below +95°).—J. Am. Pharm. Assoc. 1914, v. 3, p. 1289.

E'we, G. E.: Of five lots of oil of orange examined, all were strictly U. S. P., having optical rotations ranging from 95.3 to 97.2°.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 150.

Jensen, H. R.: Of four samples of orange oil, two were adulterated and had the odor and characters of added lemon terpenes and turpentine.—Evans' An. Notes, 1914, p. 49.

Mann, E. W.: Several samples representing both the bitter and sweet oils have given results falling within the usually accepted limits.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 36.

OLEUM AURANTII AMARI CORTICIS.

Beringer, George M.: A proposed N. F. monograph for Oleum Aurantii Amari Corticis, oil of bitter orange peel. A volatile oil obtained by expression from the fresh peel of the bitter orange, *Citrus aurantium* Linné *subspecies amara* Linné. It should be kept in small amber-colored, well-stoppered bottles in a cool place. Oil that has developed a terebinthinate odor should not be dispensed.—J. Am. Pharm. Assoc. 1914, v. 3, p. 875.

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OLEUM AURANTIUM FLORUM.

Beringer, George M.: A proposed monograph for Oleum Aurantii Florum, oil of orange flowers; oil of neroli. A volatile oil distilled from the fresh flowers of the bitter orange, *Citrus aurantium* Linné *subspecies amara* Linné (*Citrus vulgaris* Risso, *Citrus Bigaradia* Risso). It should be kept in small amber-colored, well-stoppered bottles in a cool place protected from light.—J. Am. Pharm. Assoc. 1914, v. 3, p. 875.

OLEUM BERGAMOTTÆ.

Beringer, George M.: A proposed N. F. monograph for Oleum Bergamottæ, oil of bergamot. A volatile oil obtained by expression from the rind of the fresh fruit of *Citrus bergamia* Risso. It should be kept in small amber-colored bottles in a cool place, protected from light.—J. Am. Pharm. Assoc. 1914, v. 3, p. 876.

Roure-Bertrand Fils: Tables showing the production and destination of Messina oil of bergamot during the years 1911, 1912, and 1913.—Sc. & Ind. Bull. April, 1914, p. 51.

Jensen, H. R.: Seven samples of bergamot oil ranged from 0.8825 to 0.8855 specific gravity; refractive index, 1.465 to 1.4662; optical rotation, 8.26° to 17.50°; saponification value, 180.3 to 203.7.—Evans' An. Notes, 1914, p. 13.

Mann, E. W.: The refined methods of adulteration now employed render it necessary to make a very long and complete analytical examination to insure the purity of oil of bergamot.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 28.

Richter, Ernst: A sample of oil of bergamot was found to be turbid.—Apoth.-Ztg. 1914, v. 29, p. 211.

OLEUM BETULÆ.

U. S. P. IX: General article under methyl salicylate to replace the present U. S. P. VIII text for the oil of sweet birch, oil of gaultheria, and methyl salicylate, includes the requirement that the source from which the product is derived in every case must be stated on the label.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1104, and Abstr. Prop. Changes, Part 5, 1914, p. 5.

Watson and Sayre: Oil of birch and methyl salicylate. Some new color reactions for the differentiation of oil of wintergreen.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1658–1659.

Schimmel & Co.: Control tests of oils generally confirm the statements made by the Bureau of Chemistry of the United States Department of Agriculture regarding the color reaction of oil of wintergreen, oil of sweet birch, and methyl salicylate, except that betula oil at first gave a decidedly paler color than did gaultheria oil.—

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Semi-Ann. Rep. 1914, April, p. 98–99. See also Murray, B. L.: Oil, Paint, and Drug Rep. 1914, v. 86, September 30, p. 34.

Anon.: A wintergreen mill. An illustrated description of a plant for making oil of birch.—Spatula, 1914, v. 20, p. 217–218.

E'we, G. E.: All lots of oil of sweet birch examined were optically inactive. One was orange color instead of the usual yellowish white.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 151.

OLEUM CADINUM.

U. S. P. IX: Specific gravity 0.980 to 1.055 at 25°. Completely soluble in 3 volumes of ether, amyl alcohol, chloroform, glacial acetic acid, or oil of turpentine, but only partly soluble in petroleum benzine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1106, and Abstr. Prop. Changes, Part 5, 1914, p. 7.

E'we, G. E.: The three samples of oil of cade tested were completely soluble in alcohol and not completely soluble in ether, but answered all other U. S. P. requirements. The U. S. P. requires exactly the reverse as regards alcohol and ether solubilities.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 148.

Jensen, H. R.: One sample examined of a type frequent in commerce was obviously derived from conifers other than *Juniper oxycedrus*. The acetic-acid content by water extraction reached 0.6 per cent.—Evans's An. Notes, 1914, p. 15.

Anon.: The wood of the cade, *Juniperus oxycedrus*, yields from 1.6 to 3 per cent of essential oil, which can be used as a substitute for oil of cade in dermatology.—Pharm. Era, 1914, v. 47, p. 555.

OLEUM CAJUPUTI.

U. S. P. IX: Distilled from the fresh leaves and twigs of several varieties of *Melaleuca leucadendron* Linné. The oil is to be colorless or yellowish. Specific gravity, from 0.912 to 0.925 at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1106, and Abstr. Prop. Changes, Part 5, 1914, p. 7.

Schimmel & Co.: The largest quantities of the oil of cajuput go to the United States, where the oil is used in the manufacture of a few well-established patent medicines.—Semi-Ann. Rep. April, 1914, p. 33.

Dodge, Francis D.: A further note on the determination of cineol. The phosphoric acid and the resorcinol processes are of little use in the presence of camphor or terpineol. The permanganate method as described is not satisfactory for oils containing less than 50 per cent of cineol.—J. Ind. & Eng. Chem. 1914, v. 6, p. 863–864.

Jensen, H. R.: Twenty-seven samples of oil of cajuput, all genuine, with one exception, which gave: Specific gravity, 0.902; refractive

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index, 1.465; optical rotation, —2.40°; cineol, 45 per cent.—Evans' An. Notes, 1914, p. 15.

Mann, E. W.: with 1 exception, the whole of the 11 samples of oil of cajuput tested accorded with the constants laid down in the Ph. Brit. V. Specific gravity of this oil was but 0.9135 and cineol content low, viz, 48 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 29.

Schimmel & Co.: A slight copper content is almost characteristic of crude cajuput oil.—Semi-Ann. Rep. April, 1914, p. 33.

OLEUM CARI.

U. S. P. IX.: Yielding not less than 50 per cent by volume of carvone, soluble in 8 volumes of 80 per cent alcohol. Assay for carvone added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1106, and Abstr. Prop. Changes, Part 5, 1914, p. 7.

Editorial: Last year's Dutch crop of caraway oil was unprecedented for poor quality, the percentage of oil yielded being below any previous record.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 39. See also Schimmel & Co.: Semi-Ann. Rep. April, 1914, p. 42.

Mann, E. W.: The lower limit for specific gravity official for oil of caraway is, in our opinion, too high; otherwise all samples examined conform substantially to the Ph. Brit. tests.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 29.

OLEUM CAROPHYLLI.

U. S. P. IX: Rubric to read 82 per cent of eugenol. Specific gravity from 1.038 to 1.060 at 25°. Optical rotation slightly levogyrate not exceeding 1° 10′ in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1107, and Abstr. Prop. Changes, Part 5, 1914, p. 8.

Umney, J. C.: Analytical processes of the Ph. Brit. V. for the analysis of clove oil.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 409; also J. Soc. Chem. Ind. 1914, v. 33, p. 1222.

Albright, R. A.: The hydrogen number of commercial clove oil was found to vary from 113.2 to 113.3; the per cent of active constituent from 83.8 to 83.3.—J. Am. Chem. Soc. 1914, v. 36, p. 2202.

Orrick, W. H.: Of eight lots of oil of cloves examined all contained the proper amount of eugenol, ranging from 80 to 83 per cent, and were otherwise strictly U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 148.

Jensen, H. R.: Sixteen samples of genuine clove oils had: Specific gravity, 1.052 to 1.063; refractive index, 1.5314 to 1.5357; optical rotation, —0.40° to 0°; phenols, 88 to 96 per cent; soluble in 70 per cent alcohol 1 to 1½ volumes.—Evans's An. Notes, 1914, p. 26.

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Mann, E. W.: Results obtained by the examination of 16 samples, all of which were considered to be of satisfactory quality were: Specific gravity, 1.046 to 1.056; rotation, —0.50° to —0.85°; refractive index, 1.5242 to 1.5339; eugenol, from 83 to 92 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 32.

Cochran and Perkins: As a preservative of starch sirups 0.04 per cent of sassafras or clove, or cassia is better preservative than 0.08 per cent of juniper berry.—J. Ind. & Eng. Chem. 1914, v. 6, p. 306.

Weinland and Neff: The iron combinations of the phenols. Combinations of eugenol and of vanillin with iron.—Arch. Pharm. 1914, v. 252, p. 600–608.

OIL, CHAULMOOGRA.

Francis, E.: The true chaulmoogra oil is obtained from *Taraktogenos kursii*. This oil is sometimes substituted by an oil obtained from the seeds of *Hydnocarpus wightiana*, a tree of the same family growing in Malabar.—Répert. pharm. 1914, v. 26, p. 198–199. See also Francis, Ernest E.: Lancet, 1914, v. 186, p. 718.

Jensen, H. R.: Owing to the very close overlapping of the chemical and physical values of chaulmoogra oil, it is scarcely practicable at present to differentiate between the oils.—Evans' an. Notes, 1914, p. 22.

Heiser, Victor G.: The chaulmoogra oil treatment of leprosy, an outline of the method employed.—Rep. Philippine Islands Bur. Health, 1914, p. 94–95. See also Public Health Rep. 1914, v. 29, p. 21–22.

OLEUM CHENOPODII.

U. S. P. IX: Distilled from *Chenopodium ambrosioides anthelminticum* Linné. Specific gravity, 0.955 to 0.980 at 25°. Optical rotation levogyrate varying between —4° and —10° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1107, and Abstr. Prop. Changes, Part 5, 1914, p. 8.

Henkel, Alice: An illustrated description of *Chenopodium anthelminticum* L.—Phys. Drug News, 1914, v. 9, p. 121; also Spatula, 1914, v. 20, p. 285.

Rabak, Frank: The physical properties of oil of chenopodium obtained during successive seasons from 1907 to 1910 easily fall within the requirements prescribed by the Pharmacopœia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1673.

Mann, E. W.: Very little change is found in the constants observed from time to time.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 41.

Kobert, R.: Two saponin bodies have been discovered in the herb and seeds of *Chenopodium ambrosioides*, as well as in other plants

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belonging to the N. O. *Chenopodiaceæ*.—Semi-Ann. Rep. April, 1914, p. 100.

Goester, L. E.: *Chenopodium ambrosoides* Linn. is a widely distributed weed in South Africa.—Pharm. Weekblad, 1914, v. 51, p. 1111.

Motter, Murray Galt: The use of oil of chenopodium in the treatment of hookworm disease.—Public Health Rep. 1914, v. 29, p. 2651–2653; also Montreal Pharm. J. 1914, v. 25, p. 236–237, and J. Am. M. Assoc. 1914, v. 63, p. 1875.

Levy, Robert L.: Oil of chenopodium in the treatment of hookworm infections.—Report of several cases.—J. Am. M. Assoc. 1914, v. 63, p. 1946–1949.

Schimmel & Co.: In Europe the excellent medicinal qualities of American worm seed oil are continually causing an extension of the demand and we are of opinion that the future of the article is full of promise.—Semi-Ann. Rep. 1914, April, p. 99.

OLEUM CINNAMOMI.

U. S. P. IX: Distilled from the young twigs of *Cinnamomum cassia* rectified by steam distillation. Rubric to require 80 per cent of cinnamic aldehyde. Specific gravity from 1.045 to 1.063 at 25°. Optical rotation varies from +1 to −1° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1107, and Abstr. Prop. Changes, Part 5, 1914, p. 8.

Noyes, C. R.: The commercial oil of cassia frequently contains lead and copper. The pure oil may be had for a not much higher price and it may never be had unless it is insisted upon.—Proc. Minnesota Pharm. Assoc. 1914, p. 192; also J. Am. Pharm. Assoc. 1914, v. 3, p. 855.

Schimmel & Co.: Efforts to discover cassia oil that is free from colophony meet with great difficulty. The suppliers are only willing to guarantee a definite aldehyde content.—Semi-Ann. Rep. April, 1914, p. 42.

Congdon, Leon A.: Three samples of oil of cassia; one not standard.—Rep. Kansas Bd. Health, 1914, p. 100. See also Sayre, L. E.: Bull. Kansas Bd. Health, 1914, v. 10, p. 24.

E'we, G. E.: One lot of oil of cassia examined assayed 90 per cent of cinnamic aldehyde, had a specific gravity of 1.050 and was otherwise strictly U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 148.

Jensen, H. R.: Eleven samples of cassia oil gave: Specific gravity, 1.061 to 1.0685; refractive index, 1.5972 to 1.6047; optical rotation, +4.25° to +6.35°; cinnamic aldehyde per cent, 77 to 84; acid value, 7.9 to 27.3.—Evans' An. Notes, 1914, p. 18.

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Mann, E. W.: Satisfactory aldehyde percentages characterized both samples of oil of cassia tested. Specific gravity was 1.0585 and 1.063, respectively; cinnamic aldehyde, 79 and 81 per cent; refractive index, 1.5985 and 1.5992.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 30.

Rupe, Steiger and Riedler: Several derivatives of cinnamic acid. A report on experimental work.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 63–75.

Phillips, H. Adie: The stability of cinnamic aldehyde, with report of experimental observations.—Pharm. J. 1914, v. 93, p. 129–130; also Year-Book of Pharmacy, 1914, p. 371–374, and Perf. & Ess. Oil Rec. 1914, v. 322–323.

Umney, J. C.: Cinnamic aldehyde occurs in the oils of cinnamon and cassia, and is not produced on a large scale synthetically.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 17.

Alsberg, C. L.: Imitation extracts of cinnamon should be plainly labeled to show that they are imitation extracts.—S. R. A.-Chem. 1914, p. 114.

U. S. P. IX: To direct the use of recently boiled distilled water in making cinnamon water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 525, and Abstr. Prop. Changes, Part 3, 1914, p. 2.

Serger, H.: Review of some of the recent literature relating to the use of cinnamic aldehyde and related compounds as chemical preservatives.—Chem.-Ztg. 1914, v. 38, p. 354.

Cochran and Perkins: As a preservative of starch sirup, 0.04 per cent of oil of sassifras or clove or cassia is more efficient than 0.08 per cent of oil of juniper berry.—J. Ind. & Eng. Chem. 1914, v. 6, p. 306.

News Note: Cinnamic aldehyde in the form of oil of cinnamon is reported as being in current use by school children in Lima, Ohio, as an intoxicant.—N. A. R. D. Notes, 1914, v. 19, p. 176.

Oil of Ceylon cinnamon.—Mann, E. W.: The Ph. Brit. authorities have apparently accepted the views of some English distillers with regard to the proportion of cinnamic aldehyde characteristic of the true cinnamon bark oil. Samples examined during the two years have been very diverse in character. Specific gravity is found to vary from 0.950 to 1.044; the cinnamic aldehyde from — to 90 per cent; the refractive index from 1.5226 to 1.5079.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 30–31.

Jensen, H. R.: Twenty-seven samples of true cinnamon bark oil had: Specific gravity, 1.024 to 1.0335; refractive index, 1.5805 to 1.5927; cinnamic aldehyde, 69 to 80 per cent; soluble 70 per cent alcohol, 2 to 4 volumes. One sample contained 25 per cent phenols and was rejected as containing about 20 per cent leaf oil.—Evans' An. Notes, 1914, p. 24.

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Dück: One sample of oil of cinnamon had a specific gravity of 1.034 and contained only 58.1 per cent of cinnamic aldehyde.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 235.

News Note: A sample of oil labeled oil of cinnamon, Ceylon, was on examination found to be oil of cinnamon leaf.—Pharm. Era, 1914, v. 47, p. 580.

Editorial: In chemical and physical characters, oil of Seychelles cinnamon leaf differs very little from the Ceylon oil.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 130.

OLEUM COPAIBÆ.

Semmler and Jakubowicz: Contribution to our knowledge of volatile oils and the separation and properties of East Indian oil of copaiba and of the sesquiterpene gurjunene and derivatives of the sesquiterpene.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 1141-1153.

E'we, G. E.: Two of the five samples of oil of copaiba examined were slightly low in specific gravity, each testing 0.893.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 149.

Mann, E. W.: In two batches of copaiba oil, which agreed very closely with the standards laid down in the Ph. Brit. V, the specific gravity was found to vary from 0.901 to 0.894; rotation from —14.0° to —25.5°; refractive index from — to 1.4950.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 32.

OLEUM CORIANDRI.

U. S. P. IX: Specific gravity from 0.863 to 0.875 at 25°. Optical rotation from +8 to +13° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1107, and Abstr. Prop. Changes, Part 5, 1914, p. 8.

Schimmel & Co.: Business in this formerly important product has fallen off greatly.—Semi-Ann. Rep. 1914, April, p. 49.

Mann, E. W.: Three samples of oil of coriander examined proved to possess normal characters. Specific gravity ranged from 0.879 to 0.880; rotation from +10.4° to +10.5°; refractive index from 1.4702 to 1.4725. All clearly soluble in 3 volumes of alcohol (70 per cent).—Ann. Rep. Southall Bros. & Barclay, 1914, p. 32.

Cochran and Perkins: As a preservative of starch sirups coriander is superior to sweet fennel, which in turn is superior to lavender and caraway.—J. Ind. & Eng. Chem. 1914, v. 6, p. 307.

OLEUM CUBEBÆ.

U. S. P. IX: Optical rotation to read from —20 to —40° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1107, and Abstr. Prop. Changes, Part 5, 1914, p. 8.

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Maines and Gardner: In the manufacture of extract of cubeb the oil of cubeb can be obtained as a by-product by simply redistilling the exhausted drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1327.

Editorial: The boiling point of oil of cubeb. Report of Messrs. Oranje, of Amsterdam.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 372.

Brewis, E. Theodore: The difference in the character of oil of cubebs distilled from fresh or old cubeb. A requirement that 60 to 65 per cent of the oil should distill between 250 and 280° would probably be entirely satisfactory.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 256–257. See also p. 276.

Roberts, J. G.: The rejection of one lot of oil of cubeb was recommended because it had a low optical rotation, indicating the presence of false cubeb.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 148.

E'we, G. E.: Of two lots of oil of cubeb examined both had lower optical rotation than the U. S. P. limit of 25°, namely, —20.2° and —20°. Otherwise they were strictly U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 149.

Congdon, Leon A.: One sample of oil of cubeb; doubtful.—Rep. Kansas Bd. Health, 1914, p. 100.

Mann, E. W.: Two samples of normal oil of cubeb had a specific gravity of 0.924 and 0.915.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 32.

OLEUM ERIGERONTIS.

E'we, G. E.: One lot of oil of erigeron examined had a higher specific gravity than the U. S. P. limit of 0.865, namely, 0.870. The optical rotation was +58.5° and the sample was otherwise U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 149.

OLEUM EUCALYPTI.

U. S. P. IX: Distilled from the fresh leaves of *Eucalyptus globulus* Labillardière or from other species of Eucalyptus. Rubric to read not less than 70 per cent of eucalyptol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1107; and Abstr. Prop. Changes, Part 5, 1914, p. 8.

Noyes, C. R.: Oil of eucalyptus as ordinarily sold is the oil of *Eucalyptus amygdalina*. This contains very little eucalyptol and is comparatively valueless.—J. Am. Pharm. Assoc. 1914, v. 3, p. 854; also Proc. Minnesota Pharm. Assoc. 1914, p. 190.

Schimmel & Co.: The quality of newly arrived parcels of oil of eucalyptus is satisfactory throughout. These oils contain in part over 58 per cent of eucalyptol.—Semi-Ann. Rep. April, 1914, p. 61.

Turner and Holmes: Estimation of cineol in oil of eucalyptus. The method is based on the fact that arsenic acid forms with cineol an addition compound which is sufficiently stable for all practical purposes.—J. Am. Pharm. Assoc. 1915, v. 4, p. 351–358.

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Dodge, Francis D.: A further note on the determination of cineol. The phosphoric acid and the resorcinol processes are of little use in the presence of camphor or terpineol. The permanganate method as described is not satisfactory for oils containing less than 50 per cent of cineol.—J. Ind. & Eng. Chem. 1914, v. 6, p. 863–864.

Harding, H. G. A.: Determination of the cineol content of eucalyptus oils. Outline of the modified resorcinol method.—Pharm. J. 1914, v. 93, p. 701.

E'we, G. E.: Of two lots of oil of eucalyptus examined, both were strictly U. S. P., having optical rotations of +3° and +1.3° and specific gravities of 0.919 and 0.915.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 149.

Jensen, H. R.: The cineol average for two years was 84.7 per cent for the Bosistos oil and 92.1 per cent for the Burnside oil.—Evans' An. Notes, 1914, p. 32.

Antony, H.: The use of oil of eucalyptus in perfumes and cosmetics, with a number of formulas for perfumes, soaps, and mouth washes.—Seifensieder Ztg. 1914, v. 41, p. 731–732.

Milner, I. N.: In my treatment of pneumonia oil of eucalyptus is in constant use.—Ellingwood's Therap. 1914, v. 8, p. 175–176.

OLEUM FŒNICULI.

U. S. P. IX: Optical rotation may vary from +12° to +24° in a 100 mm. tube at 25°. Congealing point not below 3°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1108, and Abstr. Prop. Changes, Part 5, 1914, p. 9.

Rabak, Frank: The physical properties of oil of fennel distilled during several successive seasons at Arlington vary somewhat from the requirements included in the Pharmacopœia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1673.

Anon.: The congealing point of menthol and of oil of fennel is a more readily demonstrated factor than is the melting point. Menthol congeals at from 40° to 41° and oil of fennel at from 2° to 3°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 272.

Albright, Alan R.: The hydrogen number of commercial fennel oil was found to be 101.3; the per cent of active constituent, 83.9.—J. Am. Chem. Soc. 1914, v. 36, p. 2202.

Patch, E. L.: Reports the specific gravity of oil of fennel as 0.9784 (U. S. P. 0.953 to 0.973); congealing point 0° (U. S. P. not below 5°); optical rotation +14.5°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1288.

Dück: A sample of oil of fennel had a specific gravity of 0.951 and was not completely soluble in 8 parts of 80 per cent alcohol.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 234.

Jensen, H. R.: Three genuine samples of fennel oil had: Specific gravity, 0.9715 to 0.975; refractive index, 1.5295 to 1.5305; optical

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rotation, +16.15° to +17°; soluble 90 per cent alcohol one-half volume.—Evans' An. Notes, 1914, p. 33.

Mann, E. W.: Three samples of oil of fennel had freezing points considerably below those characterizing the unsophisticated oil. Of nine samples examined, six were entirely satisfactory.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 33.

OLEUM GAULTHERIÆ.

U. S. P. IX: General article under methyl salicylate to replace the present U. S. P. VIII text for the oil of sweet birch, oil of gaultheria, and methyl salicylate, includes the requirement that the source from which the product is derived in every case must be stated on the label.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1104, and Abstr. Prop. Changes, Part 5, 1914, p. 5.

Noyes, C. R.: Frankly, I do not recommend the purchase of this oil, nor that of sweet birch. Use methyl salicylate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 854; also Proc. Minnesota Pharm. Assoc. 1914, p. 190.

Umney, J. C.: The natural oil is principally derived from the bark of the sweet birch, which grows in Canada and the northern United States.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 13.

Anon.: A wintergreen mill. An illustrated description of a plant for making oil of birch.—Spatula, 1914, v. 20, p. 217–218.

Watson and Sayre: Oil of birch and methyl salicylate. Some new color reactions for the differentiation of oil of wintergreen.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1658–1659.

Schimmel & Co.: Control tests of oils generally confirm the statements made by the Bureau of Chemistry of the United States Department of Agriculture regarding the color reaction of oil of wintergreen, oil of sweet birch, and methyl salicylate.—Semi-Ann. Rep. 1914, April, 98–99. See also Murray, B. L.: Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34, and Am. Druggist, 1914, v. 62, p. 365.

Editorial: Samples of oil of birch and oil of wintergreen distilled especially were found to vary considerably from by far the larger number of samples of the natural oil met with in commerce.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 130.

Rippetoe, J. R.: Two samples of wintergreen were found to contain 16.38 and 25.64 per cent of alcohol (70 per cent) extract and 2.44 and 2.74 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Jensen, H. R.: Nine samples of wintergreen oil derived from white birch had: Specific gravity, 1.187 to 1.189; refractive index, 1.5362 to 1.537; optical rotation, 0° to ±0.5°; saponification value 369 to 374.5.—Evans' An. Notes, 1914, p. 70.

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Strode, Sylvanus E.: Of two samples of oil of wintergreen examined, one was not passed.—Rep. Ohio D. & F. Div. 1914, p. 119.

Woods, Chas. D.: Of 25 samples of spirit of gaultheria, 13 were not within 10 per cent of official strength. The samples varied from 56 to 204 per cent of the official strength.—Off. Inst. Maine Agric. Exper. Sta. 1914, No. 61, p. 90.

Hortvet, Julius: Of 19 samples of extract of wintergreen examined, 11 were reported illegal. Rep. Minnesota D. & F. Com. 1914, p. 57.

Lythgoe, Hermann C.: Of 63 samples of spirit of wintergreen examined, 6 were found to be adulterated and 57 genuine.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 410.

OLEUM GOSSYPII SEMINIS.

Rather, J. B.: Utilization of the proteins of cotton seed by man.—J. Am. Chem. Soc. 1914, v. 36, p. 584–586. See also Wells, C. A.: J. Ind. & Eng. Chem. 1914, v. 6, p. 338–339.

Anon.: Cotton seed oil to the extent of 175,000,000 gallons was produced in the United States the past year.—Meyer Bros. Drug. 1914, v. 35, p. 358.

Editorial: Introductory to a series of articles treating on the subject of cotton seed products and their uses.—Oil, Paint & Drug Rep. 1914, v. 85, June 27, p. 10. See also v. 85, September 21, p. 36.

Palmer and Wright: Ethyl ester of linolic tetrabromide as a product in the analysis of cotton seed oil.—J. Ind. & Eng. Chem. 1914, v. 6, p. 822–823.

Gastaldi, Ernico: The modification suggested by Utz for the Halphen reaction for cotton seed oil.—Ann. chim. applicata, 1914, v. 2, p. 203–207.

Shaw, T. W. A.: The catalytic reduction of oleic acid and cotton seed oil by means of hydrogen in presence of finely divided nickel.—J. Soc. Chem. Ind. 1914, v. 33, p. 771–774.

Wingard, Ake: Autoöxidation and the changes in physical characteristics of fatty oils.—Svensk farm. Tidskr. 1914, v. 18, p. 265–270, 281–287.

Thoms, H.: A comparison of the physical and chemical properties of cotton seed oil and of hydrogenated cotton seed oil.—Arb. pharm. Inst. Univ. Berl. 1914, p. 145.

Mann, E. W.: Normal results were obtained for each of the four samples of cotton seed oil tested. Specific gravity ranged from 0.922 to 0.925; saponification value from 191.4 to 194.4; iodine value from 105.5 to 109.4; free fatty acid (as oleic) from 0.06 to 1.24 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 14.

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OLEUM HEDEOMÆ.

U. S. P. IX: Distilled from the flowering plant of *Hedeoma pulegioides* Linné Persoon. Optical rotation to read from +17 to +28° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1108, and Abstr. Prop. Changes, Part 5, 1914, p. 9.

Jensen, H. R.: Eighteen genuine samples of pennyroyal oil were tested with the normal values: Specific gravity, 0.9355 to 0.9505; optical rotation, +14.45° to +22.30°.—Evans' An. Notes, 1914, p. 50.

Mann, E. W.: Specific gravity of two samples of oil of pennyroyal was 0.935 and 0.941; rotation, +21.0° and +18.75°; refractive index, 1.4836 and 1.4853.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 36.

OLEUM JUNIPERI.

U. S. P. IX: Distilled from the ripe fruit of *Juniperus communis* Linné. Specific gravity from 0.854 to 0.888. Optical rotation may vary from 0 to —15° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1108, and Abstr. Prop. Changes, Part 5, 1914, p. 9.

Henkel, Alice: An illustrated description of *Juniperus communis* L.—Phys. Drug News, 1914, v. 9, p. 120. See also Spatula, 1914, v. 20, p. 283, and Chem. & Drug. 1914, v. 84, p. 108.

Noyes, C. R.: Oil of juniper is generally sold in the form of imitations containing a variable amount of oil of turpentine or other cheap pine distillate.—Proc. Minnesota Pharm. Assoc. 1914, p. 192; also J. Am. Pharm. Assoc. 1914, v. 3, p. 855.

Editorial: Examination of a number of samples of old oil of juniper has furnished additional evidence of the changes occurring in this oil on keeping which make the framing of definite physical constants somewhat difficult.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 5–6.

E'we, G. E.: One lot of oil of juniper examined had a specific gravity of 0.8602 and was otherwise strictly U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 149.

Mann, E. W.: We have not met with any cases of adulteration in oil of juniper during the period under review; all samples have given results in conformity with the characters and tests of the Ph. Brit. V.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 34.

OLEUM LAVANDULÆ FLORUM.

U. S. P. IX: Distilled from the fresh flowering tops of *Lavandula vera* DeCandolle (*Lavandula officinalis* Chaix, *Lavandula spica* Linné). Specific gravity from 0.875 to 0.888 at 25°. Optical rotation may vary from —1 to —10° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1108, and Abstr. Prop. Changes, Part 5, 1914, p. 9.

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Bristow-Noble, J. C.: Illustrated description of cultivation and harvesting of lavender.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 348–351.

Noyes, C. R.: Oil of lavender is generally sold in the form of imitations containing as much oil of turpentine or cheap pine distillate as is necessary to make the product fit the price.—J. Am. Pharm. Assoc. 1914, v. 3, p. 855; also Proc. Minnesota Pharm. Assoc. 1914, p. 192.

Rabak, Frank: Samples of oil of lavender distilled during several successive seasons at Arlington were found to be somewhat higher in specific gravity than the requirements of the Pharmacopœia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1673.

Dodge, Francis D.: Examination of oil of lavender; the separation of foreign ester and the estimation of acetin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1667–1668.

Rupp, E.: Outline of method for determining the ether number of oil of lavender.—Apoth.-Ztg. 1914, v. 29, p. 724; also Südd. Apoth.-Ztg. 1914, v. 54, p. 322.

Editorial: Sample of oil of lavender distilled from the dried flowers was found to have an ester content of 61.6 per cent. The oil was decidedly sweet in odor and if produced in considerable quantities should bring a relatively high price.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 130.

Francois, J. G. R.: The solubility of oil of lavender. The contention that the proportion of 1 in 4 will not suffice for modern types of oil of lavender.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 147.

Hankey, William T.: Of 16 samples of oil of lavender examined 6 were rejected. The linalyl acetate content varied from 25.75 to 40.43 per cent.—Proc. Ohio Pharm. Assoc. 1914, p. 48.

Jensen, H. R.: Three samples of abnormal lavender oils (English) with good aroma, which may have been matured with alcohol, had: Specific gravity, 0.8795 to 08847; refractive index, 1.4647 to 1.4689; optical rotation, −9° to −9.5°; linalyl acetate, 8.8 to 9.5 per cent.—Evans' An. Notes, 1914, p. 41.

Mann, E. W.: The figures for 12 genuine foreign oils were: Specific gravity, 0.887 to 0.900; esters as linalyl acetate, 31.7 to 40.1 per cent; refractive index, 1.4617 to 1.4652.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 34.

OLEUM LIMONIS.

U. S. P. IX: Obtained by expression from the fresh, ripe peel of *Citrus medica* Linné, variety *Limonum* (Risso) Hooker filius. Refractive index, 1.4744 to 1.4755 at 20°. Optical rotation to read from +57 to +64° in a 100 mm. tube at 25°. Modified assay for citral.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1108, and Abstr. Prop. Changes, Part 5, 1914, p. 9.

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Roure-Bertrand Fils: Tables showing the production and destination of Messina oil of lemon during the years 1911, 1912, and 1914.—Sc. & End. Bull. April, 1914, p. 51.

Editorial: The Ph. Brit. V, 4 per cent, minimum citral content for oil of lemon is questioned.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 397.

Marden and Elliott: In the determination of citral in lemon oil, it is better and more economical to use 50 per cent alcohol for the extraction and to dilute to the proper strength of alcohol later.—J. Ind. & Eng. Chem. 1914, v. 6, p. 930.

Böcker, E.: The citral determination of concentrated citral oils.—J. Prakt Chem. 1914, v. 90, p. 393–404.

Little, L. D.: A colorimetric method for the determination of citral in extracts of lemon and in oil of lemon.—J. Am. Pharm. Assoc. 1914, v. 3, p. 553–556; also Am. Perf. 1914, v. 9, p. 74–75.

Sachsse, E.: A new method of valuation of concentrated lemon oils.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 262–263.

Dodge, Francis D.: The detection of pinene in oil of lemon. A modified nitrosochloride method.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1664–1665.

Seaber, W. M.: Sample of artificially colored lemon oil. The oil was exceptionally brilliant in color, probably from the use of dimethyl-amido-azo-benzene (butter yellow).—Perf. & Ess. Oil Rec. 1914, v. 5, p. 43.

Roberts, J. G.: Two shipments of oil of lemon were received. One complied with all the requirements of the U. S. P., while the other had a low optical rotation.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 149.

Stockinger, O.: One lot of oil of lemon had a specific gravity of 0.850 and an optical rotation of +59°. It was otherwise U. S. P. The assay method is not satisfactory.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 149.

Editorial: Samples of Malaga lemon oil have recently arrived in London. The oil has a sweet and pleasant odor and flavor, not very similar to that of Messina lemon oil, and reminding one of a mixture of citrus peel oils.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 41.

Hankey, William T.: The citral content of six samples of oil of lemon varied from 4.22 to 5.2 per cent.—Proc. Ohio Pharm. Assoc. 1914, p. 48.

Jensen, H. R.: For 37 samples of lemon oil the figures were: Specific gravity, 0.855 to 0.860; refractive index, 1.4745 to 1.4763; optical rotation, +57.30° to +64°; citral, 4 to 5.35 per cent, 3.4 to 4.6 gms. in 100 cc.—Evans' An. Notes, 1914, p. 41.

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Mann, E. W.: The Ph. Brit. V standard for citral is too high; 3.5 per cent would have been a far more reasonable and practicable minimum. Two samples examined yielded 2.62 and 1.10 per cent of citral, respectively.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 35.

OLEUM LINI.

Anon.: A review of market conditions in linseed oil.—Chem. & Drug. 1914, v. 85, p. 356. See also p. 850, v. 84, p.457–458; and Drugs, Oils & Paints, 1914, v. 29, p. 368–369.

Anon.: Standard specifications for the purity of raw linseed oil from North American seed. The properties, tests, and methods of testing.—J. Ind. & Eng. Chem. 1914, v. 6, p. 164.

Thurston, Azor: The testing of linseed oil for gloss oil. The U. S. P. saponification test for rosin products in linseed oil is too indefinite in case of adulteration with small quantities of rosin products which are more or less saponifiable.—J. Am. Pharm. Assoc. 1914, v. 3, p. 174–175.

Smith and Tuttle: The iodine number of linseed and petroleum oils. The results of experiments indicate that concordance is obtained only when a prescribed procedure is followed with exactness.—J. Washington Acad. 1914, v. 4, p. 316; also J. Ind. & Eng. Chem. 1914, v. 6, p. 994–998, and Oil, Paint & Drug Rep. 1914, v. 85, June 29, p. 34.

Pailler, E. C.: Analysis of linseed oil. A comparison of all the constants of linseed oil shown by four samples.—Chem. Eng. 1914, v. 19, p. 110–112.

Jensen, H. R.: Of the "raw" variety, 13 samples of linseed oil had: Specific gravity, 0.932 to 0.935; refractive index, 1.4821 to 1.484; saponification value, 189 to 197; iodine value, 170 to 184 (average 178).—Evans' An. Notes, 1914, p. 43. See also Mann, E. W.: Ann. Rep. Southall Bros. & Barclay, 1914, p. 17.

Frost, W. A.: Linseed oil manufactured by the so-called new process does not comply with the requirements of the Pharmacopœia.—Northwestern Druggist, June, 1914 ,v. 15, p. 23.

Bárány, F.: A rapid method for the determination of the unsaponifiable portion of linseed-oil varnish not volatile at 100°.—Ztschr. Anal. Chem. 1914, v. 53, p. 684–685.

Sayre, L. E.: The adulterants of linseed oil are now becoming so very adroit that it is difficult to detect them.—Bull. Kansas Bd. Health, 1914, v. 10, pfl 174.

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Table showing some of the analytical results reported for linseed oil.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	27	11	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, L. A.	3	3	Proc. Kentucky Pharm. Assoc. 1914, p. 119.
Congdon, Leon A.	24	17	Rep. Kansas Bd. Health, 1914, p. 100.
Hortvet, Julius	14	5	Rep. Minnesota D. & F. Com. 1914, p. 47.
Sayre, L. E.	8	5	Bull. Kansas Bd. Health, 1914, v. 10, p. 27, 178.
Shannon, F. L.	22	9	Rep. Michigan D. & F. Com. 1914, p. 118.
Shannon, F. L.	15	8	Bull. Michigan D. & F. Dept. 1914; January-February, p. 10; March-April, p. 13; September-October, p. 12.
Strode, Sylvanus E.	10	2	Rep. Ohio D. & F. Div. 1914, p. 122.

OLEUM MENTHÆ PIPERITÆ.

U. S. P. IX: Distilled from the flowering plant of Mentha piperita Linné, rectified by steam distillation. Levogyrate from −20° to −33° in a 100 mm. tube at 25°. Assay for esters and total menthol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1109, and Abstr. Prop. Changes, Part 5, 1914, p. 10.

Anon.: An illustrated description of the Kalamazoo (Mich.) peppermint fields.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 252–253.

Gattefossé, R. M.: The cultivation of English peppermint and the adoption of English methods of rectification have given new types of French oils that are in every way comparable to good English essences.—Perf. & Ess. Oil Rec. 1914, v. 6, p. 7.

Irk, Karl: The production of Japanese peppermint oil in various countries. A study of experimental results obtained in Germany and in other countries.—Pharm. Zentralh. 1914, v. 55, p. 459–462.

Schimmel & Co.: Table showing the production of peppermint oil and of menthol during the years 1909–1912, inclusive.—Semi-Ann. Rep. April, 1914, p. 79.

Anon.: A chart giving a graphic review of the fluctuation in the value of oil of peppermint during two decades from 1894 to 1913.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 142–143.

Rabak, Frank: The peppermint oils from four successive seasons were found to have a somewhat higher specific gravity than the upper limits of the Pharmacopœia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1673.

Finneran, J. F.: At the present time it is impossible to buy in Massachusetts or from any of the New York importers who sell essential oils U. S. P. oil of peppermint.—Proc. Maine Pharm. Assoc. 1914, p. 42.

Mann, E. W.: The Ph. Brit. V now provides for total menthol and for esters, the minimum in the former case being 50 per cent and

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in the latter 5 per cent. All of the samples examined during the two years were in satisfactory agreement with these requirements.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 37.

Penniman and Randall: A rapid method for the determination of camphor and of certain essential oils when in solution in alcohol. A report on six extracts of peppermint.—J. Ind. & Eng. Chem. 1914, v. 6, p. 926–928.

Redfield, Harry W.: One cause of low results in the assay of peppermint oil is the low efficiency of the reflux condenser that is employed.—J. Ind. & Eng. Chem. 1914, v. 6, p. 401–402. See also Am. Perf. 1914, v. 9, p. 73.

Wöhlk, Alfred: A comparative examination of several commercial varieties of oil of peppermint and their control by the determination of menthol.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 292–303.

Glickman, L. H.: Of five samples of oil of peppermint examined, only one was a trifle low in total menthol.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 150.

Jensen, H. R.: Twenty-nine samples of peppermint oil gave: Specific gravity, 0.8985 to 0.9075; refractive index, 1.459 to 1.4621; optical rotation, −22.37° to −28.8°; total menthol, 49.1 to 65.7 per cent; menthyl acetate, 5 to 11.7 per cent.—Evans' An. Notes, 1914. p. 51.

Cochran and Perkins: When 0.08 per cent of the oil is used, the value of the oils as preservatives of starch sirups is as follows: (1) Peppermint, (2) citronella, (3) juniper berry.—J. Ind. & Eng. Chem. 1914, v. 6, p. 306.

OLEUM MENTHÆ VIRIDIS.

U. S. P. IX: Rubric to require not less than 40 per cent by volume of carvone. Optical rotation to read from −35° to −50° in a 100 mm. tube at 25°. Assay for carvone added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1109, and Abstr. Prop. Changes, Part 5, 1914, p. 10.

Schimmel & Co.: According to the information gathered by our New York firm, the 1913 crop has yielded about 10,000 pounds of oil more than that of 1912.—Semi-Ann. Rep. April, 1914, p. 92.

Rabak, Frank: Oil of spearmint distilled during several successive seasons at Arlington exhibited decided variation of solubility in 80 per cent alcohol. One sample showed an optical rotation above that of the maximum in the Pharmacopœia.—J. Am. Pharm. Assoc. 1914. v. 3, p. 1673.

Mann, E. R.: The characters and tests of both samples of oil of spearmint examined were practically in accord with the requirements of the Ph. Brit. V. Specific gravity was 0.931 and 0.930; rotation, −43.5– and −51°; refractive index, 1.4865 and 1.4855.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 40.

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Anon.: Supply of cod liver oil, a review.—Lancet, 1914, v. 186, p. 1476.

Mann, E. W.: The new official Ph. Brit. V monograph on cod liver oil shows a great advance on the old one, which was absolutely inadequate. The color tests are deleted, and a set of constants introduced, which appear to be quite satisfactory.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 12.

Fernau, Albert: Commercial samples of cod liver oil do not comply with the Ph. Austr. nitric acid test. The Ph. Austr. VIII iodine number is low and might be allowed to vary from 140 to 175.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 263.

Munn, W. A.: There are only two places in the world where the business of manufacturing cod liver oil has been carried on to any large extent; these are Norway and Newfoundland. The industry, in both places, is especially adapted to shore fisheries.—Montreal Pharm. J. 1914, v. 25, p. 192–197.

Gehe & Co.: A table showing the variations in the production of Norwegian cod liver oil during the years 1903 to 1914, inclusive.—Handelsbericht, 1914, p. 100. See also Pharm. J. 1914, v. 92, p. 428, and Brit. & Col. Drug. 1914, v. 65, p. 329–330.

Jolles, Adolf: The determination of cod liver oil in emulsions. A comparative review of several methods.—Apoth.-Ztg. 1914, v. 29, p. 695–697. See also Feist, K.: Apoth.-Ztg. 1914, v. 29, p. 744, and Pharm. Zentralh. 1914, v. 55, p. 582.

Jaenicke: The determination of fat in commercial cod liver oil emulsions.—Pharm. Ztg. 1914, v. 59, p. 188. See also Feyen, p. 252, and Zölfl, K., p. 542.

Jensen, H. R.: Thirty-three genuine samples of high quality medicinal Norwegian oils had: Specific gravity, 0.926 to 0.9275; refractive index, 1,4801 to 1.4813; acid value, 0.2 to 2.5; saponification value, 184.1 to 197.3; iodine value, 155.3 to 174.9.—Evans' An. Notes, 1914, p. 27.

Mayer, Joseph L.: The iodine number of 12 samples of cod liver oil was found to vary from 135 to 160.—Proc. New York Pharm. Assoc. 1914, p. 115.

Arends, Georg: Fixed formulas for emulsions of cod liver oil are not always satisfactory. Some oils are much more limpid than others and require special treatment.—Apoth.-Ztg. 1914, v. 29, p. 986.

Beringer, George M., jr.: A comparison of the value of various flavorings for emulsion of cod liver oil.—Proc. New Jersey Pharm. Assoc. 1914, p. 81–82.

Carlson, C. E.: The preparation of ferrated cod liver oil and the determination of the iron content.—Svensk farm. Tidskr. 1914, v. 18, p. 478–482.

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Hommell, P. S.: The extracts of cod liver or of cod liver oil do not represent the remedial value of the oil.—Drug. Circ. 1914, v. 58, p. 74.

Osborne and Mendel: The influence of cod liver oil and some other fats on growth. The authors have obtained uniform success by substituting cod liver oil for a portion of the lard in their standard diets.—J. Biol. Chem. 1914, v. 17, p. 401–408.

Editorial Note: The unwavering popularity of cod liver oil in diseases of nutrition is all the more remarkable in this age of substitutes, which, in spite of vigorous pushing, have failed to oust the remedy of our childhood.—Lancet, 1914, v. 186, p. 1476.

OLEUM MYRSITICÆ.

U. S. P. IX: Specific gravity to read from 0.1859 to 0.924 at 25°. Optical rotation, from −14 to −30° in a 100-mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1109, and Abstr. Prop. Changes, Part 5, 1914, p. 10.

Mann, E. W.: A considerable amount of diversity obtains in the properties of oil of nutmeg. The official range is, however, very comprehensive and included the whole of the samples examined during 1913 and 1914.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 36.

Jensen, H. R.: Thirteen genuine samples of oil of nutmeg had: Specific gravity, 0.882 to 0.906; refractive index, 1.4746 to 1.4844; optical rotation, 10° 30′ to 24° 20′; nonvolatile residue per cent, 0.4 to 3.6.—Evans' An. Notes, 1914, p. 45.

OLEUM OLIVÆ.

Kantschieder, Joh. Slaus: The refining of olive oil and other fatty oils.—Arch. Chem. u. Micros. 1914, v. 7, p. 111–115. See also Bontoux, E.: Seifensieder Ztg. 1914, v. 41, p. 204–205, 233–234, 259–260, 286–287, 313–314, 342–344, 388–389, 416–417.

Roure-Bertrand Fils: The exports of olive oil from France are constantly on the increase to those countries which have customs tariffs which protect the pure product.—Sc. & Ind. Bull. April, 1914, p. 67–70.

Jackson, Cook, and Strickland: Olive oil alone should be dispensed whenever sweet oil or salad oil is called for.—Rep. Rhode Island F. & D. Com. 1914, p. 16.

Bohrisch, P.: A test for peanut oil should be added to the Ph. Germ. V requirements for olive oil.—Pharm. Zentralh. 1914, v. 55, p. 810; also Apoth.-Ztg. 1914, v. 29, p. 902.

Kühl, Hugo: A review of a number of available reactions for the testing of olive oil.—Südd. Apoth.-Ztg. 1914, v. 54, p. 86–87.

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Rupp, E.: Modified method for applying the Halphen reaction.—Südd. Apoth.-Ztg. 1914, v. 54, p. 322; also Apoth.-Ztg. 1914, v. 29, p. 724.

Eastlick, R. W.: The possible danger from the deodorization of low-grade olive oil, a new branch of industry.—Am. Food J. 1914, v. 9, p. 112.

Canzoneri and Bianchini: The rancidity of olive oil and the oxidation of oleic acid in presence of light.—Ann. chim. applicata, 1914, v. 1, p. 24–32.

Alsberg, Carl L.: As a result of investigation, it is believed that in some instances olive oil is intentionally misbranded by the shippers.—Am. Food J. 1914, v. 9, p. 21. See also S. R. A.-Chem. 1914, p. 23.

Enz. Karl: Two samples of olive oil offered as superfine pure olive oil were found on examination to consist of mixtures of peanut oil and castor oil.—Südd. Apoth.-Ztg. 1914, v. 54, p. 429.

Galloway, B. T.: Adulteration and misbranding of olive oil. One lot of supposed pure olive oil was found to be adulterated with cotton seed oil.—S. R. A.-Chem. 1914, p. 104.

Notices of Judgment Nos. 2800, 2861, 2873, 2874, 2875, 2890, 3115, 3445, and 3477 relate to the adulteration and misbranding of olive oil.—S. R. A.-Chem. 1914, p. 36, 94, 103–104, 123, 333, 683, and 709.

Hankey, William T.: The specific gravity of 52 samples of olive oil was found to vary from 0.9088 to 0.9128.—Proc. Ohio Pharm. Assoc. 1914, p. 51.

Mann, E. W.: The examination of 144 samples of olive oil gave: Specific gravity, 0.915 to 0.918; saponification value, 188 to 194.7; iodine value, 80 to 87.5; refractive index, 1.4682 to 1.4701.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 20.

Jensen, H. R.: Seventy out of 100 samples of olive oil, all genuine, varied between 0.915 and 0.918 specific gravity; 1.4702 and 1.4708 refractive index; 79 and 88.7 iodine value; 0.7 and 7.1 free acid per cent.—Evans' An. Notes, 1914, p. 46.

Table showing some of the analytical results reported for olive oil.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E	15	1	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, Lucius P	7	4	Bull. Tennessee F. & D. Dept. 1914, v. 1, No 1, p. 27.
Hortvet, Julius	32	4	Rep. Minnesota D. & F. Com. 1914, p. 47.
Jackson, Cook, and Strickland	223	99	Rep. Rhode Island F. & D. Com. 1914, p. 17.
Lythgoe, Hermann C	28	0	Rep. Massachusetts Bd. Health, 1914, p. 410.
Mayer, Joseph L	15	0	Proc. New York Pharm. Assoc. 1914, p. 115.
Street, John Phillips	2	1	Rep. Connecticut Agric. Exper. Sta. 1914, p. 333.
Strode, Sylvanus E	5	2	Rep. Ohio D. & F. Div. 1914, p. 122.
Sudro, W. F	93	3	Rep. North Dakota F. Com. 1914, p. 34.
Todd, A. R	4	1	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R	4	1	Bull. Michigan D. & F. Dept. 1914, March-April, p. 19.
Wiedemann, H. C	26	1	Rep. Missouri F. & D. Com. 1914. p. 39.
Woods, Chas. D	6	4	Off. Insp. Maine Agric. Exper. Sta. 1914, No. 61, p. 101.

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OLEUM PICIS LIQUIDÆ.

U. S. P. IX: Specific gravity to read from 1.012 to 1.065 at 25°. It is soluble in alcohol, the solution showing an acid reaction with litmus.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1109, and Abstr. Prop. Changes, Part 5, 1914, p. 10.

Roberts, J. G.: Oil of tar does not usually meet the requirements of the U. S. P., as it is generally very dark in color and has a high specific gravity. The U. S. P. specifies that it should have a specific gravity of about 0.892. We obtained the following specific gravities on three samples: 1.004, 1.05, and 1.027.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 152.

Hankey, William T.: The phenols in oil of tar were found to vary from 51 to 89 per cent.—Proc. Ohio Pharm. Assoc. 1914, p. 52.

OLEUM PIMENTÆ.

U. S. P. IX: Specific gravity to read from 1.18 to 1.48 at 25°. Optical rotation may vary from 0 to −4° in a 100 mm. tube at 25°. "Miscible in all proportions in 90 per cent alcohol" changes to "soluble in an equal volume of 90 per cent alcohol." Assay for eugenol as directed under Oleum Caryophylli.—J. Am. Pharm. Assoc. 1914. v. 3, p. 1110, and Abstr. Prop. Changes, 1914, Part 5, p. 10.

Albright, Alan R.: The hydrogen number of commercial pimenta oil was found to be 87.8; the per cent of active constituent 71.5.—J. Am. Chem. Soc. 1914, v. 36, p. 2202.

Mann, E. W.: The specific gravity of two samples of oil of pimenta was 1.051 and 1.052; eugenol content 90 to 89 per cent; and refractive index 1.5334 and 1.5338, respectively.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 37.

OIL OF PINE NEEDLES.

Mann, E. W.: Samples of oil of *Pinus pumilio* showed a much lower percentage of esters than that now official in the Ph. Brit. Three samples examined varied in specific gravity from 0.865 to 0.869; rotation from −7.3° to −11.7°; esters as bornyl acetate from 4.9 to 92 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 38.

Jensen, H. R.: Nine samples of pumilio oil varied in specific gravity from 0.8695 to 0.873; refractive index from 1.4748 to 1.4762; optical rotation from −4° 50′ to −9° 30′; bornyl acetate average 4.9 per cent.—Evans' An. Notes, 1914, p. 53.

Toch, Maximilian: The chemistry of pine oil. Analyses of a number of samples of common pine oil presented in the form of tables.—J. Soc. Chem. Ind. 1914, v. 33, p. 576–578. For correction see p. 780.

Schorger, A. W.: Oils of the coniferæ. I. The lead and twig oils of Cuban and long-leaf pines and the cone oil of long-leaf pine, with

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an illustrated description of the apparatus used.—J. Ind. & Eng. Chem. 1914, v. 6, p. 723–727. See also p. 809–810.

OLEUM RICINI.

Grosh, Daniel M.: The cultivation of the castor oil bean.—Drug. Circ. 1914, v. 58, p. 197–198.

Berger, E.: Castor beans, their commercial cultivation and uses.—Proc. Florida Pharm. Assoc. 1914, p. 11–12.

Llewellyn, J. M.: Castor oil and castor bottle; a brief review of the distribution and use of this product.—Drug. Circ. 1914, v. 58, p. 203. See also p. 659.

Utech, P. H.: A harmless color for castor oil.—Am. Druggist, 1914, v. 62, p. 8.

Honovski, B. R.: Some transformation of ricinoleic and oleic acids.—J. Am. Chem. Soc. 1914, v. 36, p. 1028–1035.

Mann, E. W.: The misleading sulphuric acid test for castor oil has been deleted from the Ph. Brit. All the samples examined, 35 in number, gave results according with the new official Ph. Brit. requirements. The specific gravity ranged from 0.960 to 0.965; saponification value from 177.7 to 182.9; refractive index from 1.4777 to 1.4794.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 11.

Jensen, H. R.: Three hundred and fifty distinct samples of genuine castor oils gathered during the last three years gave the following figures: 0.2 to 6.7 per cent free acid; 0.6 to 5.3 per cent average acid; refractive index 1.4799 to 1.4813.—Evans' An. Notes, 1914, p. 19.

Anon.: Several formulas for tasteless castor oil.—Drug. Circ. 1914, v. 58, p. 214. See also p. 729.

Amos, W. S.: Aromatic castor oil is a good preparation and is in demand; a slight increase in the oil of cinnamon is advisable.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

Lander and Geake: The detection of castor seeds. The biological determination of ricin.—Analyst, 1914, v. 39, p. 292–293.

OLEUM ROSÆ.

Anon.: An illustrated description of the production of oil of rose in Bulgaria.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 344–346. See also p. 134.

Anon.: A description of the famous rose gardens of Lyon.—Montreal Pharm. J. 1914, v. 25, p. 80–81.

Gattefossé, R. M.: French otto from garden roses. A record of recent research in French roses in general.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 316–319.

Petkow, N.: The composition and the adulteration of oil of rose.—Ztschr. öffentl. Chem. 1914, v. 20, p. 149–153.

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Lilly, J. K.: Two lots of oil of rose received from two different sources were found to be adulterated with oil of rose geranium.—Proc. N. W. D. A. 1914, p. 261; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Petkow, N.: In addition to oil of rose geranium the dealers in rose oil are now using synthetically prepared stereopten and ceril belonging to the group of the paraffins.—Apoth.-Ztg. 1914, v. 29, p. 491.

Anon.: Adulteration of rose oil with geranium oil may be recognized by the higher saponification number and refractive index.—Western Druggist, 1914, v. 36, p. 341.

Jensen, H. R.: Twenty samples of rose oil were tested during the year, but the quality of the supplies available, for reasons which will be readily understood, has been more unsatisfactory than for many years.—Evans' An. Notes, 1914, p. 56.

OLEUM ROSAMARINI.

U. S. P. IX: Solubility in 90 per cent alcohol omitted. Assay for ester and total borneol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1110, and Abstr. Prop. Changes, Part 5, 1914, p. 11.

Mann, E. W.: The majority of the oils examined were slightly levogyrate, the angle of rotation being usually less than 1°. A few samples were classed as adulterated, with marked levo-rotation and low specific gravity.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 38.

Jensen, H. R.: Twelve samples of pure "French" rosemary oils were found to vary within the following limits: Specific gravity, 0.897 to 0.911; refractive index, 1.4683 to 1.4725; optical rotation, −1.50° to +14.0°; total borneol, 14 to 17 per cent; bornyl acetate, 2 to 2.5 per cent.—Evans' An. Notes, 1914, p. 57.

OLEUM SABINÆ.

Editorial: The oil of savin which is being passed into commerce from the south of France continues to be distilled from various species of *Juniperus*, including *Juniperus phoenicea*, and possibly *Juniperus thurifera*.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 131.

Mann, E. W.: The saponification values of four specimens of foreign oil of savin examined proved to average somewhat higher than those we reported upon in our last issue. Specific gravity was 0.903 to 0.915; rotation, +51.7° to +57.3°; refractive index, 1.4721 to 1.4750.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 40.

Jensen, H. R.: One sample of savin oil had: Specific gravity, 0.9085; refractive index, 1.4736; optical rotation, +61.45°; saponification value, 117.0.—Evans' An. Notes, 1914, p. 60.

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U. S. P. IX: Optical rotation to read from −15 to −20° in a 100 mm. tube at 25°. Modified assay for santalol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1110, and Abstr. Prop. Changes, Part 5, 1914, p. 11.

Holmes, E. M.: In recent years sandalwood plants have become affected by what is known as the spike disease.—Am. J. Pharm. 1914, v. 86, p. 31–37.

Roure-Bertrand Fils: Two tables showing the approximate quantities of various qualities of sandalwood which were put up at auctions in 1913 and the prices realized at these sales.—Sc. & Ind. Bull. April, 1914, p. 56–57.

Baker, H. D.: The sandalwood trade is controlled chiefly by about half a dozen leading European firms.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 64.

Lilly, J. K.: Sandalwood chips have been replaced frequently by raspings of an unknown wood. These raspings are bright red in color and possess none of the characteristics of sandalwood.—Proc. N. W. D. A. 1914, p. 263; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 35.

Maines, E. L.: Sandalwood was found to contain from 4.20 to 5.76 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Alsberg, C. L.: Misuse of the term "sandalwood oil." The proper name for West India sandalwood oil, which is in fact not a sandalwood oil at all, is oil of *Amyris balsamifera*, and this article should be labeled accordingly.—S. R. A.-Chem. 1914, p. 114.

Wende, E.: The determination of santalol content of oil of santal. A simplified method which gives results comparable with those obtained by the Ph. Germ. V method.—Apoth.-Ztg. 1914, v. 29, p. 541–542.

Baning and van der Wielen: The solubility in alcohol of oil of santal with a review of the requirements made in the several pharmacopœias and the examination of a number of samples of pure and mixed oil.—Pharm. Weekblad, 1914, v. 51, p. 1467–1470, and Apoth.-Ztg. 1914, v. 29, p. 963. See also van Itallie, E. I.: Pharm. Weekblad, 1914, v. 51, p. 1530–1531, 1489–1491, and 1491–1493.

E'we, G. E.: All samples of oil of santal examined were strictly U. S. P. in quality, ranging from 91.8 to 97 per cent of santalol, from 0.969 to 0.975 in specific gravity, and from −16° to −18.2° in optical rotation.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 151.

Hankey, William T.: Of 23 samples of oil of santal examined, 6 were rejected.—Proc. Ohio Pharm. Assoc. 1914, p. 52.

Mann, E. W.: Of the seven samples of oil of santal examined, five were soluble in 6 volumes of 70 per cent alcohol at 15°; the other two

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required in one case a temperature of 20°, in the other of nearly 30°, to effect clear solution.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 39.

Cline, R. R. D.: Samples of oil of santal were found running 98, 90, 85, 80; two only 60, and one containing only 50 per cent of santalol.—Proc. Texas Pharm. Assoc. 1914, p. 20.

J. D. Riedel, A.-G.: Report on the examination of seven samples of capsules of santalwood oil, with table showing the physical and chemical properties of the oil and the conclusion that crude adulterations of sandalwood capsules no longer occur.—Riedel's Berichte, 1914, p. 46.

Mann, H.: Sandalwood oil and its application in perfumery; a review.—Am. Perf. 1914, v. 9, p. 213–214.—Am. Perf. 1914, v. 9, p. 213–214.

Umney, J. C.: Oil of sandalwood is used in perfumery as well as for medicinal purposes. The oil is distilled from the wood of the Indian tree, which is largely cultivated in Mysore and Madras on Government plantations.—Perf. & Ess. Oil. Rec. 1914, v. 5, p. 18.

OLEUM SASSAFRAS.

U. S. P. IX: Specific gravity to read from 1.065 to 1.077 at 25°. Optical rotation from +3 to +4° in a 100 mm. tube at 25°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1110, and Abstr. Prop. Changes, Part 5, 1914, p. 11.

Albright, Alan R.: The hydrogen number of authentic sassafras oil was found to be 103.1; the per cent of active constituent, 81.1; theoretical per cent of active constituent, 80 per cent.—J. Am. Chem. Soc. 1914, v. 36, p. 2202.

E'we, G. E.: Of two lots of oil of sassafras examined, both were strictly U. S. P., ranging from 1.066 to 1.070 in specific gravity, and from +3° to +4° in optical rotation.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 151.

Mann, E. W.: Nine samples of oil of sassafras gave the following results: Specific gravity, 1.076 to 1.085; rotation, +1.9° to +2.8°; refractive index, 1.5280 to 1.5324.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 39.

Cochran and Perkins: As a preservative of starch sirups sassafras is decidedly superior to sweet birch.—J. Ind. & Eng. Chem. 1914, v. 6, p. 307.

OIL OF SESAME.

U. S. P. IX: A fixed oil expressed from the seeds of one or more cultivated varieties of *Sesamum indicum* Linné (Fam. *Pedaliaceæ*). Preserve in well-closed containers. Sesame oil is a pale yellow, oily

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liquid, almost odorless, and having a bland taste. Slightly soluble in alcohol, miscible with ether, chloroform, petroleum benzin and carbon disulphide. Specific gravity, 0.916 to 0.921 at 25°. Iodine value not less than 103 nor more than 113.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1573, and Abstr. Prop. Changes, Part 6, 1914, p. 11.

E'we, G. E.: Of two lots of oil of sesame examined, both gave a bright green color in a hydrochloric acid milk sugar identification test. This green color reaction seems to indicate rancidity, since the green color is greater in the rancid samples.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 151.

Thoms, H.: A comparison of the physical and chemical properties of oil of sesame and of hydrogenated oil of sesame.—Arb. pharm. Inst. Univ. Berl. 1914, p. 145.

Wingard, Ake: Autoöxidation and the changes in physical characteristics of fatty oils.—Svensk farm. Tidskr. 1914, v. 18, p. 265–270, 281–287.

OLEUM SINAPIS VOLATILE.

U. S. P. IX: To require not less than 92 per cent of allyl isothiocyanate. The oil may be produced synthetically or obtained from the seed of *Brassica nigra*. Modified method of assay for allyl isothiocyanate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1110, and Abstr. Prop, Changes, Part 5, 1914, p. 11.

Wester, D. H.: Report of experiments on the influence of fertilizers on the oil content of mustard seed.—Ber. pharm. Gesellsch. 1914, v. 24, p. 123.

Schneider, Clibbens, Hüllweck, and Steibelt: Examination of the mustard oils.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 1248–1258. See also p. 1258–1269, Roschdestwiensky, M., p. 1947, and Schneider and Wrede, p. 2038–2043.

Mann, E. W.: A single sample of oil of mustard assayed for allyl isothiocyanate, etc., according to the method now official gave the following satisfactory figures: Specific gravity, 1.023; boiling range, 147°–149°.; refractive index, 1.4310; allyl isothiocyanate, 96.2 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 35.

Jensen, H. R.: Seven samples of volatile oil of mustard gave the following values: Specific gravity, 1.019 to 1.023; refractive index, 1.5292 to 1.5305; optical rotation, 0° to −0.10°. One sample gave: Specific gravity, 1.0225; refractive index, 1.5275; optical index, 0°.—Evans' An. Notes, 1914, p. 45.

Schwarz, Adolf: Inhalation of the vapors of the volatile oil of mustard in the treatment of toothache and of earache.—Münch. med. Wchnschr. 1914, v. 61, p. 420–421. See also Schimmel & Co.: Semi-Ann. Rep. April, 1914, p. 70.

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U. S. P. IX: The volatile oil recently distilled from the concrete oleoresin obtained from *Pinus palustris* Mill and from other species of *Pinus* (Fam. *Pinaceæ*) with water below 100°. Optical rotation variable. Tests for resinous oils or their derivatives and for added mineral oils.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1573–1574, and Abstr. Prop. Changes, Part 6, 1914, p. 11–12.

Record, Samuel J.: Prolonging the naval-stores industry. An illustrated description of methods for tapping pine trees for turpentine.—Sci. Am. 1914, v. 110, p. 173, 186.

French and Withrow: The present status of the wood turpentine industry.—J. Ind. & Eng. Chem. 1914, v. 6, p. 148–152; also Tr. Am. Inst. Chem. Eng. 1914, v. 6, p. 217–231.

Whitaker and Bates: Chemical utilization of southern pine waste.—J. Am. & Eng. Chem. 1914, v. 6, p. 289–298.

Toch, Maximillian: The chemistry of pine oil obtained from wood waste.—J. Ind. & Eng. Chem. 1914, v. 6, p. 720–723.

Grimaldi and Prussia: The detection and determination of turpentine derivatives in oil of turpentine.—Chem.-Ztg. 1914, v. 38, p. 1001–1002; also Apoth.-Ztg. 1914, v. 29, p. 750.

Parow, E.: The thermal number of oil turpentine.—Chem.-Ztg. 1914, v. 38, p. 441.

Enz, Karl: Turpentine and oil of turpentine. A review of their physical and chemical properties.—Apoth.-Ztg. 1914, v. 29, p. 797.

Alsberg, C. L.: The development of permanent and standard type samples of rosin and turpentine.—Oil, Paint & Drug Rep. 1914, v. 86, December 7, p. 19.

Anon.: Proposed specifications for oil of turpentine from a report of the subcommittee of the American Society for Testing Materials.—Drugs, Oils & Paints, 1914, v. 30, p. 210–211.

Schorger, A. W.: A study of authentic samples of gum turpentine. The specific gravity at 15° will fall between 0.8659 and 0.8722, with an average of 0.8685. The index of refraction at 15° will fall between 1.4714 and 1.4746.—J. Ind. & Eng. Chem. 1914, v. 6, p. 541–548.

Herty and Graham: Isoprene from commercial turpentines.—J. Ind. & Eng. Chem. 1914, v. 6, p. 803–804.

Liberati and Vanderkleed: Of the 12 lots of oil of turpentine examined, 3 were a trifle low in specific gravity, ranging from 0.858 to 0.859.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 151.

Mann, E. W.: A marked range of optical rotatory power has been exhibited by 37 samples of oil of turpentine. The specific gravity was found to vary from 0.867 to 0.873; rotation from −6.5° to +17.2°; and refractive index 1.4700 to 1.4729.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 41.

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Table showing some of the analytical results reported for oil of turpentine.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	4	0	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, Lucius P.	17	3	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Congdon, Leon A.	3	2	Rep. Kansas Bd. Health, 1914, p. 100.
Jensen, H. R.	29	1	Evans' An. Notes, 1914, p. 69.
Shannon, F. L.	8	6	Rep. Michigan D. & F. Com. 1914, p. 147.
Shannon, F. L.	3	3	Bull. Michigan D. & F. Dept. 1914, March—April, p. 13.
Stadtmueller, F. H.	168	3	Rep. Connecticut D. & F. Com. 1914, p. 15.
Street, J. P.	2	2	Rep. Connecticut Agric. Exper. Sta. 1914, p. 335.

OLEUM TEREBINTHINÆ RECTIFICATUM.

U. S. P. IX: The freshly distilled oil is to be dried by shaking it with anhydrous calcium chloride, and filtering. Specific gravity from 0.856 to 0.865 at 25°. Not more than 0.010 gm. of residue.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1110, and Abstr. Prop. Changes, Part 5, 1914, p. 11.

Noyes, C. R.: Many druggists are not aware that the U. S. P. requires that rectified oil of turpentine should always be dispensed for internal purposes.—J. Am. Pharm. Assoc. 1914, v. 3, p. 853; also Proc. Minnesota Pharm. Assoc. 1914, p. 190.

Anon.: A warning to users of oil of turpentine for medicinal or veterinarian purposes to make certain that it is not adulterated.—J. Am. Inst. Homœop. 1914, v. 6, p. 1131, and Drug Topics, 1914, v. 29, p. 57.

OLEUM THEOBROMATIS.

Häussler, E. P.: A short contribution on the history of theobroma.—Pharm. Zentralh. 1914, v. 55, p. 46–47.

Gehe & Co.: Table showing the amount of oil of theobroma exported from Germany during the years 1908–1913 and the destination of this material.—Handelsbericht, 1914, p. 98.

Bohrisch, P.: The Ph. Germ. V melting point determination for oil of theobroma is not satisfactory. The ether test is also objected to.—Apoth.-Ztg. 1914, v. 29, p. 902; also Pharm. Zentralh. 1914, v. 55, p. 909.

Kroeber, Ludwig: Critical observations on the examination of oil of theobroma according to the Ph. Germ. V.—Pharm. Praxis, 1914, v. 12, p. 427–429. See also Enz: Südd. Apoth.-Ztg. 1914, v. 54, p. 372.

Bohrisch and Kürschner: The examination of oil of theobroma, with tables giving the results obtained from the Ph. Germ. method, the Filsinger method, and the Björkland method of testing.—Pharm. Zentralh. 1914, v. 55, p. 191–203.

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Grimme, Clement: The examination of cacao butter, with several tables giving the results obtained.—Pharm. Zentralh. 1914, v. 55, p. 285–288. See also Chem. Rev. Fett u. Harz Ind. 1914, v. 21, p. 47–49, 153–156, and Pharm. Ztg. 1914, v. 59, p. 284.

E'we, G. E.: Five lots of cacao butter examined melted at from 33° to 35°. One sample, to which all of the U. S. P. tests were applied. met all requirements, giving the following constants: Melting point, 33°; saponification value, 188.8; iodine value, 35.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 135.

Hankey, William T.: The melting point of 12 samples of cacao butter varied from 31.2° to 35°; the saponification value from 190.7 to 195.5; and the iodine value from 33.61 to 37.48.—Proc. Ohio Pharm. Assoc. 1914, p. 49.

Mann, E. W.: Of the 18 samples of cacao butter examined all but 1 gave satisfactory results; the single exception possessed a high iodine value, and probably contained a considerable proportion of one of the cacao substitutes.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 12.

Jensen, H. R.: Four genuine samples of cacao butter well refined had: Acid value, 0.8 to 2.2; saponification value, 194 to 199; iodine value, 35.2 to 39.9; melting point, 32° to 34°.—Evans' An. Notes, 1914, p. 26.

OLEUM THYMI.

U. S. P. IX: Specific gravity from 0.894 to 0.929 at 25°. Assay for phenols added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1110, and Abstr. Prop. Changes, Part 5, 1914, p. 11.

Beringer, George M.: A proposed monograph for thyme, the dried tops of *Thymus vulgaris* collected when the plant is in flower. Ash should not exceed 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1601.

Gutkind, Felix: An illustrated description of the distilling of oil of thyme in Spain.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 384. See also Spatula, 1914, v. 20, p. 165.

Rabak, Frank: A sample of oil of thyme obtained in 1910 was found to have a specific gravity slightly above the upper limits of the Pharmacopœia.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1673.

Baker, W. L.: Oil of thyme was found to be very dark in color.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

OPIUM.

U. S. P. IX: Obtained from *Papaver somniferum* and its variety album, with not more than 5 per cent of the capsules and leaves of the poppy plant and other foreign matter.—J. Am. Pharm. Assoc. 1914, v. 3, p. 393, and Abstr. Prop. Changes, Part 2, 1914, p. 35.

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Anon.: An illustrated description of the flowering top of *Papaver somniferum* L.—Chem. & Drug. 1914, v. 84, p. 704. See also p. 672.

White, F. Ashford: Growing opium in Turkey. Some 600 to 900 tons of opium are exported from Turkey annually.—Am. Druggist, 1914, v. 62, p. 54. See also Montreal Pharm. J. 1914, v. 25, p. 89–90, and Südd. Apoth.-Ztg. 1914, v. 54, p. 624.

Gehe & Co.: Observations on the production of opium in Austria in the neighborhood of Vienna.—Südd. Apoth.-Ztg. 1914, v. 54, p. 239. See also Pharm. Zentralh. 1914, v. 55, p. 110–111.

Editorial: It is asserted that while the opium crop is variously estimated as from 5,500 to 6,500 cases, of late years, the world's consumption is now believed to be between 9,000 and 10,000 cases.—Pharm. J. 1914, v. 92, p. 78.

Wilbert, M. I.: Sale and use of cocaine and narcotics, with table showing the quantities of the several drugs entered for consumption in the United States during the years 1910–1913.—Public Health Rep. 1914, v. 29, p. 3180–3183.

Anon.: The second supplement to the Ph. Ndl. IV requires that powdered opium contain from 9.8 to 10.2 per cent of morphine.—Pharm. Weekblad, 1914, v. 51, p. 85.

Deér, Endre: A sample of opium obtained from Constantinople was on examination found to be a product complying with the requirements of the Hungarian Pharmacopœia in all respects, and was probably derived from Asia Minor.—Pharm. Post, 1914, v. 47, p. 849.

Neal, P. C.: When we find as many as 20 carefully molded lead bullets neatly embedded in an equal number of opium balls we need not fear a libel suit if we designate such adulteration as deliberate.—Proc. Maryland Pharm. Assoc. 1914, p. 94.

Mossler, Gustav: A report of experiments on the production of opium alkaloids from poppy capsules.—Pharm. Post, 1914, v. 47, p. 483–486. See also Guttmann, A.: Pharm. Post, 1914, v. 47, p. 9.

Gordin and Kaplan: Notes on the estimation of morphine and on Lloyd's reagent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1656–1658.

Fernau, Albert: In the Ph. Austr. VIII assay for opium correlating results are obtained when the morphine, after drying on filter paper, is returned and weighed in the previously dried, originally tared flask.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 264.

Anon.: After all that has appeared in the press during the last 16 years in regard to the shortcomings of the Ph. Brit. V assay processes for opium, it is a shock to find that we are practically where we were.—Chem. & Drug. 1914, v. 85, p. 490.

Caesar & Loretz: The valuation of opium, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 91–93.

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Jensen, H. R.: Notes on opium assay on a large scale.—Evans' An. Notes, 1914, p. 46–48.

Gsell and Marschalké: The quantitative determination of several opium alkaloids, on the basis of their conversion into their methyloxyl group.—Ztschr. Anal. Chem. 1914, v. 53, p. 673–678.

Klee, Walter: The alkaloids of *Papaver orientale*. A comprehensive review.—Arch. Pharm. 1914, v. 252, p. 211–273.

Gadamer, J.: The secondary alkaloids of *Papaver orientale*.—Arch. Pharm. 1914, v. 252, p. 274–280.

Müller, A.: The importance of the alkaloids of *Papaver somniferum* for the life of the plant.—Arch. Pharm. 1914, v. 252, p. 280–293.

v. Friedrichs, Oscar: Observations on the action of mold fungi on the alkaloid content of opium. The ordinary molds do not materially influence the alkaloid content.—Ztschr. physiol. Chem. 1914, v. 93, p. 276–282.

Wester, D. H.: The moisture content of opium was found to vary from 8.6 to 13.5 per cent.—Pharm. Weekblad, 1914, v. 51, p. 1441.

Mann, E. W.: The occurrence of a considerable weight of leaden bullets showed that the old-time methods of adulteration are not yet extinct. The morphine content of eight parcels of opium (calculated as dry opium) varied from 12.2 to 16 per cent; moisture from 18.3 to 24.6 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 20.

Maines, E. L.: Opium was found to contain from 5.84 to 7.37 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Vanderkleed, C. E.: Reports six assays of opium gum; found to vary from 10.13 to 11.78 per cent of crystallized morphine; all above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Strode, Sylvanus E.: Of 10 samples of opium examined, 5 were not passed.—Rep. Ohio D. & F. Div. 1914, p. 119.

Lascoff, J. Leon: The official narcotic preparations, with tables showing the narcotic preparations of the Pharmacopœia and the preparations of the National Formulary containing opium or its derivatives.—Drug. Circ. 1914, v. 58, p. 453; Phys. Drug News, 1914, v. 9, p. 308–309.

Stotlemeyer, Charles K.: The use of water as a menstruum for exhausting opium. Report of a comparative study.—Proc. Maryland Pharm. Assoc. 1914, p. 123–125.

Osborn, W. H.: The aqueous extract of opium, while it may have some medicinal use, may for all practical purposes be supplanted by a powdered extract of opium.—Drug Topics, 1914, v. 29, p. 114.

Editorial: The new laudanum of the Ph. Brit. V.—Brit. & Col. Drug. 1914, v. 66, p. 354.

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Mackinlay, F. J.: For 1 ounce of tincture of opium that I dispense, I sell a gallon by retail, and most chemists will tell you the same thing.—Pharm. J. 1914, v. 93, p. 653.

Hamner, J. W.: Tincture of opium. The nature and composition of preparations made according to the several official pharmacopœias and containing from 30 to 90 per cent of alcohol.—Svensk farm. Tidskr. 1914, v. 18, p. 49–54.

Thomsen, Th. Sv.: The determination of morphine and opium in tincture of opium.—Arch. Pharm. og Chem. Copenhagen, 1914, v. 21, p. 329–336, 357–365.

Raeuber, E. G.: Suggestions for making tincture of opium U. S. P. and controlling complete exhaustion of the drug by the use of Mayer's reagent.—Proc. Wisconsin Pharm. Assoc. 1914, p. 66–67.

Cline, R. R. D.: Tinctures of opium were found four-fifths, three-fourths, and three only one-half the strength they should be. One tincture was 50 per cent too strong.—Proc. Texas Pharm. Assoc. 1914, p. 19.

Table showing some of the analytical results reported for tincture of opium.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, L. A.	12	11	Proc. Kentucky Pharm. Assoc. 1914, p. 117.
Stadtmueller, F. H.	40	2	Rep. Connecticut D. & F. Com. 1914, p. 15.
Street, John Phillips	40	4	Rep. Connecticut Agric. Exper. Sta. 1914, p. 335.
Strode, Sylvanus E.	6	2	Rep. Ohio D. & F. Div. 1914, p. 119.
Thurston, Azor	5	5	Proc. Ohio Pharm. Assoc. 1914, p. 43; also Midl. Drug. 1914, v. 48, p. 363.
Todd, A. R.	29	4	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R.	9	3	Bull. Michigan D. & F. Dept. 1914, January–February, p. 17.

Williams, Ed. E.: In deodorizing opium preparations the best plan is to use paraffin instead of purified benzin as the deodorizing agent.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Sargent, F. Pilkington: Paregoric; a study in evolution. A review of the origin and use of opium and the various complex preparations of opium.—Spatula, 1914, v. 20, p. 211–214, 271–274.

Todd, A. R.: Of 12 samples of paregoric examined, 1 was found to be adulterated.—Rep. Michigan D. & F. Com. 1914, p. 176.

Manseau, M.: Contribution on the subject of the laudanum of Sydenham.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 116–118.

Bennett and Cocking: Liquor opii sedativus.—Pharm. J. 1914, v. 92, p. 136–137; also Year-Book of Pharmacy, 1914, p. 412–416.

Pohl, Julius: New and old observations on the opium alkaloids.—Berl. klin. Wchnschr. 1914, v. 51, p. 1905–1907.

Wilbert, M. I.: Pharmacists should consider the possibility of developing a line of simple extractive preparations of opium that can

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not be used in place of smoking opium.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1662.

Jackson, D. E.: A note on the pharmacological action of opium alkaloids.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 57–72.

Caesar, Heinrich: A quantitative study of the variation in toxicity of morphine in combination with other opium alkaloids.—Pharm. Zentralh. 1914, v. 55, p. 246.

af Klercker, Otto: Observations on the influence of opium and opium alkaloids on certain forms of glycosuria.—Biochem. Ztschr. 1914, v. 62, p. 11–48.

Hays, Melville A.: A great many narcotic habitués owe their start in the habit to the careless, or even criminal, manner in which some physicians prescribe or dispense habit-forming drug.—New York M. J. 1914, v. 100, p. 673.

Hays, Melville A., and others: The treatment of the opium habit. Answers to prize question No. 149.—New York M. J. 1914, v. 100, p. 673–675, 721–723.

Anon.: A list of the alkaloids, derivatives, and preparations for which official order blanks will be required in New York under the Boylan law.—Drug Topics, 1914, v. 29, p. 104–105.

Anon.: The third International Opium Conference; a review.—Brit. M. J. 1914, v. 2, p. 86–87. See also Rev. Internat. Pharm. Brux. 1914, v. 2, p. 4–7; Chem. & Drug. 1914, v. 84, p. 458, v. 85, p. 14–15, 34; and Oil, Paint & Drug Rep. 1914, v. 86, July 20, p. 18.

News Note: The new opium restriction regulations issued in connection with the measure approved on January 17, prohibiting the importation and use of opium for other than medicinal purposes.—Oil, Paint & Drug Rep. 1914, v. 85, March 9, p. 33.

For additional references on opium see Index Med.; J. Am. M. Assoc.; Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

OXYGEN.

Cohen, J. B.: The discovery of oxygen and the credit due to Hales and to Lavoisier.—Chem. World, 1914, v. 3, p. 247–250.

Wagner, Hans: A review of the methods employed in the production of oxygen, peroxides, and related products.—Südd. Apoth.-Ztg. 1914, v. 54, p. 627–628, 643–644.

Linder, Carl: The extraction of oxygen by means of the fractional vaporization of liquid air.—Rev. gén. chim. 1914, v. 17, p. 97–105.

Bancroft, Wilder D.: A book review of a volume by Georges Claude on liquid air, oxygen, and nitrogen.—J. Phys. Chem. 1914, v. 18, p. 178–179.

Anon.: The normal boiling point of oxygen has been determined by Henning as −182.97°.—Nature, 1914, v. 93, p. 16.

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Germann, Albert F.-A.: A contribution on the determination of the density of oxygen.—J. chim. phys. 1914, v. 12, p. 66–108.

Franke, Oscar: Oxygen baths in the climacteric.—Therapist, 1914, v. 24, p. 91–92.

Burge, W. E. and E. L.: The rôle of nascent oxygen in regulating the activities of enzymes in animals and plants.—Am. J. Physiol. 1914, v. 34, p. 140–148.

McCrae, John: The subcutaneous injection of oxygen as a therapeutic measure.—Am. J. M. Sc. 1914, v. 148, p. 830–838. See also Warden, A. A.: Brit. M. J. 1914, v. 2, p. 1021.

Brackmann: Oxygen inhalation in diseases of the respiratory tract.—Deutsch. med. Wchnschr. 1914, v. 40, p. 229–230.

Macfarlane, W. I.: Experience with nitrous oxide and oxygen.—Dental Digest, 1914, v. 20, p. 16–19. See also Guy, G.: Dental Cosmos, 1914, v. 56, p. 1296; Miller, Albert H.: J. Am. M. Assoc. 1914, v. 63, p. 1474–1475.

PANCREATINUM.

Long and Muhleman: The mutual action of certain digestive ferments. Observations on the action of hydrochloric acid and pepsin on amylopsin, the action of acid on glycerol extracts, the action of pepsin on amylopsin, and the action of hydrochloric acid and pepsin on trypsin.—Arch. Int. Med. 1914, v. 13, p. 314–348; also Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 8–53.

Edie, E. S.: On the resistance of trypsin solutions to heat.—Biochem. J. 1914, v. 8, p. 84–89.

Porter, Agnes Ellen: On the behavior of trypsin in the presence of a specific precipitate.—Biochem. J. 1914, v. 8, p. 50–58.

Scoville, W. L.: Trypsin solutions are rapidly destroyed by traces of alkali, but are protected by the presence of albumin or calcium salts. Slightly acid solutions are permanent.—Bull. Pharm. 1914, v. 28, p. 484.

Lénard, D.: Trypsin that has been made inactive by the addition of acids could not again be reactivated by neutralization or by the addition of alkalies.—Biochem. Ztschr. 1914, v. 60, p. 54.

Editorial: A recent notice by the Bureau of Chemistry of the Department of Agriculture includes a warning that preparations claiming to contain digestive enzymes must be put up in such a way that they will have suffered little if any loss of activity when sold to the consumer. Preparations known to deteriorate on keeping will have to bear a time-limit label.—Drug Topics, 1914, v. 29, p. 178.

Lepetit, Dollfus, and Gansser: Stable pancreatic extracts for industrial use. French Patent 466,276, May 29, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 613.

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Graber, Howard T.: Precautions to be observed in the assay of pancreatin if uniform results are to be obtained.—J. Ind. & Eng. Chem. 1914, v. 6, p. 402–403.

Long and Barton: A comparison of methods for the determination of the proteolytic activity of pancreas preparations.—J. Am. Chem. Soc. 1914, v. 36, p. 2151–2166; also Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 92–112.

Macquire, P.: Assay of pancreatic amylolytic diastase.—Compt. rend. Acad. sc. 1914, v. 158, p. 1289–1291.

Crohn and Epstein: The stimulating effect of serum on pancreatic amylase.—J. Biol. Chem. 1914, v. 17, p. 317–324.

Roberts, J. G.: One lot of pancreatin was rejected because of an objectionable putrefactive odor.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 153.

E'we, G. E.: Of 12 lots of pancreatin examined, 4 were slightly below U. S. P. strength in starch-converting power, while the other 8 tested 1.25.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 153.

Müller and Pinkus: Observations on the physiologic and therapeutic action of pancreas extracts.—Biochem. Ztschr. 1914, v. 61, p. 337–371.

Weiland, W.: The theory and application of organotherapy, including the use of pancreas and other organotherapeutic preparations.—Therap. Monatsh. 1914, v. 28, p. 229–240.

Lambelle, F. W.: The use of trypsin and amylopsin in the treatment of malaria; an abstract.—Public Health Rep. 1914, v. 29, p. 168–169.

Wetzel, Martin: On the behavior of the complement in pancreatin poisoning.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 149–160.

Kirchheim, Ludwig: An experimental study on trypsin poisoning.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 374–398.

Ellingwood, Finley: Pancreatic extract has been used for some years with the hope that it would ultimately be found to control diabetes.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 207.

PARAFFINUM.

Marcusson and Schlüter: The origin of earth wax, particularly ozokerite.—Chem.-Ztg. 1914, v. 38, p. 73–74.

Rakusin, M. A.: Separation of paraffin wax from petroleum oils by cold methods.—J. Soc. Chem. Ind. 1914, v. 33, p. 684 (Petroleum, 1914, 9, 1374–1375).

Holde, D.: The production of paraffin with an illustration showing the vertical section of a paraffin sweating oven in use by the Standard Oil Co. of Indiana.—J. Ind. & Eng. Chem. 1914, v. 6, p. 43.

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Kantorowicz, H.: Observations on the properties of mineral oil and of mineral wax.—Chem.-Ztg. 1914, v. 38, p. 494–495.

Shrewsbury, Herbert S.: Note on Shrewsbury's reaction for paraffin. The test is not intended to be of a very accurate nature.—Analyst, 1914, v. 39, p. 296.

Baker, W. L.: Paraffin was found to taste strongly of mineral oils.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Anon.: Hard paraffin as a solvent for fats in certain tinctures and fluid extracts.—Am. Druggist, 1914, v. 62, p. 250.

Paris Correspondent: Barthe de Sandfort reports excellent results from the application of paraffin as a plaster or compress in the case of rheumatism, gout, varicose veins, sciatica, and lumbago.—Brit. M. J. 1914, v. 1, p. 993.

Davis, Benjamin Franklin: Report of a case of cancer in one of the employees in the paraffin department of a large oil refining company located near Chicago.—J. Am. M. Assoc. 1914, v. 62, p. 1716–1720.

For additional references on paraffin see Chem. Abstr.; Chem. Zentralbl.; Chem. Rep.; Jahresber. Pharm.; J. Chem. Soc. Lond.; and J. Soc. Chem. Ind.

PARALDEHYDUM.

Williams, Joseph H.: Paraldehyde is manufactured by treating acetaldehyde with small quantities of hydrochloric acid, when the temperature rises somewhat, and practically the whole is converted into paraldehyde.—Pharm. J. 1914, v. 93, p. 293. See also: Southern Pharm. J. 1914, v. 7, p. 60.

Linke, H.: The Ph. Germ. V. specific gravity of 0.998 to 1.000 corresponds with paraldehyde free from acetaldehyde and the statement that paraldehyde may contain about 4 per cent of acetaldehyde is therefore conflicting.—Apoth.-Ztg. 1914, v. 29, p. 489.

Jensen, H. R.: Nine samples of paraldehyde of satisfactory purity had: Specific gravity, 0.999 to 0.9995; melting point, 10° to 11.8°. Traces of free acid were only detected in two samples.—Evans's An. Notes, 1914, p. 49.

Lefeldt, M.: Paraldehyde burns with a slightly luminous flame.—Pharm. Ztg. 1914, v. 59, p. 43.

Collier, G. K.: The intravenous use of paraldehyde.—(N. Y. State J. Med. v. 14, No. 3) J. Am. M. Assoc. 1914, v. 63, p. 1199.

Sulzmann, M.: The harmful narcotic action of alcohols of the fatty series may be eliminated or greatly modified by administering simultaneously fixed oils or fats.—Drug Topics, 1914, v. 29, p. 151.

PAREIRA.

Baker, W. L.: Pareira brava was found to be of a spurious variety.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

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Rippetoe, J. R.: One sample of pareira was found to contain 6.03 per cent of alcohol (58 per cent) extract and 1.98 per cent of ash.—Am. J. Pharm., 1914, v. 86, 441.

Schaltz and Koch: The alkaloid of pareira root.—Arch. Pharm. 1914, v. 252, p. 513–536.

PELLETIERINAE TANNAS.

Anon.: The Ph. Brit. V. includes pelletierinae tannas, a mixture of the tannates of the alkaloids obtained from *Punica granatum*. The dose is 2 to 8 grains.—Chem. & Drug. 1914, v. 85, p. 487.

PEPO.

U. S. P. IX: The dried seeds of cultivated varieties of *Cucurbita pepo* with not more than 5 per cent of other harmless seeds.—J. Am. Pharm. Assoc. 1914, v. 3, p. 393, and Abstr. Prop. Changes, Part 2, 1914, p. 35.

PEPSINUM.

Quant, Ernest: The purity of pepsin bacteriologically considered. Of 11 samples examined only 2 were free from micro-organisms.—Pharm. J. 1914, v. 92, p. 120–121; also Chem. & Drug. 1914, v. 85, p. 176, and Yearbook of Pharmacy, 1914, p. 333–337.

Michaelis and Mendelssohn: Observations on the conditions necessary for developing the activity of pepsin.—Biochem. Ztschr. 1914, v. 65, p. 1–15.

Long and Muhleman: The mutual action of certain digestive ferments.—Arch. Int. Med. 1914, v. 13, p. 314–348.

Lénard, D.: A contribution to our knowledge of pepsin. Pepsin inactivated by alkali or by neutralization is reactivated after being allowed to stand some time with the required amount of acid.—Biochem. Ztschr. 1914, v. 60, p. 43–55.

Fernau, Albert: Samples of pepsin that are not active at 40° frequently become so on warming to 44° or 45°. An assay process directing the latter temperature would be preferable.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 264.

Graber, Howard T.: Observations upon the assay of digestive ferments.—J. Ind. & Eng. Chem. 1914, v. 6, p. 402–403.

Hercod, E.: A proposition for adoption of an international method for titrating pepsin.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 790–791.

Glickman, L. H.: Of 90 lots of pepsin scale examined during the year, 86 were up to the U.S.P. requirement of 1:3000. The other 4 lots tested under 1:2500.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 153.

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Patch, E. L.: Reports that pepsin was diluted with sugar instead of sugar of milk. Acid in powdered pepsin varied from 0.9 to 8 per cent, and in scale from 6.8 to 7.6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1289.

Editorial: A notice from the Bureau of Chemistry draws attention to the possibly inert character of many products claimed to contain certain enzymes.—Drug Topics, 1914, v. 29, p. 178. See also: N. A. R. D. Notes, 1914, v. 19, p. 616.

Anon.: Excess of trypsin inhibits the digestive action of pepsin in acid solutions, and excess of pepsin hinders the digestive action of trypsin in alkaline media.—Western Druggist, 1914, v. 36, p. 342.

Fuld, E.: A discussion on the identity of chymosin and pepsin action.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 781–789. See also van Dam, W., p. 770–780.

Hammarsten, Olof: Study on chymosin and pepsin action. The rapidity of coagulation as a measure of chymosin action.—Ztschr. physiol. Chem. 1914, v. 92, p. 119–143.

Amos, W. S.: Antiseptic solution of pepsin contains a slight precipitate, taste strongly acid—the odor indicates that the pepsin is old. The name "physol" suggests a nostrum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

For additional references on pepsin see Chem. Abstr.; Chem. Zentralbl.; and Zentralbl. Physiol.

PETROLATUM.

Sanders, J. McC.: The fractional distillation of petroleum.—J. Chem. Soc. Lond. 1914, v. 105, p. 1697–1703.

Day, David T.: Petroleum and its derivatives. The origin and industrial treatment of mineral oil.—Sci. Am. Suppl. 1914, v. 77, p. 194–195.

Wilbert, M. I.: With the single exception of the Ph. Brit. all of the European pharmacopœias use vaselin as the official title for petrolatum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 655.

Linke, H.: Even the better quality of yellow vaseline does not comply strictly with the Ph. Germ. V. vaseline requirements and tests, particularly the sulphuric acid test and the melting point requirement.—Apoth.-Zeg. 1914, v. 29, p. 490.

Linke, H.: The melting point of vaseline can be most readily determined in a straight capillary tube.—Apoth.-Ztg. 1914, v. 29, p. 694.

Gift, W. J.: Vaseline is an excellent ointment base, but substances carried by it do not penetrate the skin at all and it therefore is only used where external medication is desired.—Proc. Indiana Pharm. Assoc. 1914, p. 59.

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Bastedo, W. A.: White petrolatum has been employed in the treatment of chronic intestinal stasis in the form of flavored and usually colored jelly in place of the liquid paraffin. It is apparently just as active as the liquid preparation.—J. Am. M. Assoc. 1914, v. 63, p. 718.

PETROLATUM LIQUIDUM.

Anon.: Liquid paraffin, paraffin oil, and liquid albolene are practically synonymous with the pharmacopœial title "liquid petrolatum."—J. Am. M. Assoc. 1914, v. 62, p. 2043.

Anon.: There is something that grows more rapidly than mushrooms and that is the brands of liquid petrolatum or Russian petroleum oil for intestinal stasis and constipation.—Critic and Guide, 1914, v. 17, p. 236.

Peck, J. Wicliffe: Liquid paraffin. What it is and how it is made; with illustrations.—Pharm. J. 1914, v. 92, p. 508–509.

Day, David T.: Petroleum and its derivatives; a review.—J. Frankl. Inst. 1914, v. 177, p. 271–285.

Puckner, W. A.: A review of the requirements for liquid petrolatum made in the existing pharmacopœias; some discussion of the history and present uses of the preparation and descriptions of heavy and light liquid petrolatum.—J. Am. M. Assoc. 1914, v. 62, p. 1740–1742; also Rep. Council Pharm. Chem. 1914, p. 22–29, and Am. J. Pharm. 1914, v. 86, p. 322–329.

Scoville, W. L.: The increased demand for an oil suitable for internal administration has brought oils possessing high physical qualities into the market.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1289.

Kantorowicz, H.: Observations on the properties of mineral oil and of mineral wax.—Chem.-Ztg. 1914, v. 38, p. 494–495.

Engler and Steinkopf: Observations on the testing of mineral oils for optical activity.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 3358–3362.

Brooks and Bacon: The fluorescence of petroleum distillates. It is found that halogenation destroys the fluorescence and that hydrogenation also destroys it.—J. Ind. & Eng. Chem. 1914, v. 6, p, 623–625.

Smith and Tuttle: The iodine number of linseed and petroleum oils.—J. Washington Acad. 1914, v. 4, p. 316; also J. Ind. & Eng. Chem. 1914, v. 6, p. 994–998.

Hilton, S. L.: Report of examination of a number of samples of white mineral oil. The specific gravity was found to vary from 0.8536 to 0.8040.—J. Am. Pharm. Assoc. 1914, v. 3, p. 577–579; also Am. J. Pharm. 1914, v. 86, p. 360–363, and Am. Druggist, 1914, v. 62, p. 162–163.

Baker, W. L.: Two lots of liquid petrolatum were rejected on account of turbidity.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

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Mayer, Joseph L.: The specific gravity of 30 samples of liquid petrolatum was found to vary from 0.859 to 0.877 at 25°.—Proc. New York Pharm. Assoc. 1914, p. 115.

E'we and Vanderkleed: Of 10 lots of Russian mineral oil examined, the specific gravity ranged between 0.8595 and 0.880, 3 were slightly flourescent, all had a very faint kerosene taste, but only 2 were objectionable on this account. All gave some color with sulphuric acid, but only those which possessed an objectionable, kerosene taste were found to react strongly with the acid.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 150.

Bastedo, W. A.: Of nine samples which had been mixed with an equal volume of sulphuric acid, a portion not having been heated, and a portion having been heated on a water bath for 10 minutes, nearly all failed to come up to the requirements.—J. Am. M. Assoc. 1914, v. 63, p. 717.

Vicarrio, A.: The internal use of liquid paraffin. Some observations on the coloration produced by sulphuric acid.—Pharm. J. 1914, v. 92, p. 283. See also J. pharm. et chim. 1914, v. 9, p. 149–154, also 458–459, and Merck's Rep. 1914, v. 23, p. 109.

Peck, J. Wicliffe: Liquid paraffin; its use in the treatment of intestinal stasis.—Pharm. J. 1914, v. 92, p. 28–29. See also p. 126.

Wilbert, M. I.: A review of some of the literature showing renewed interest in the use of paraffin oil.—J. Am. Pharm. Assoc. 1914, v. 3, p. 580–585; also Am. J. Pharm, 1914, v. 86, p. 150–154, and Pharm. Era, 1914, v. 47, p. 208–209.

Maughan, D.: A note on the sterilization of liquid paraffin.—Pharm. J. 1914, v. 92, p. 81–82; also Farm. Españ. 1914, v. 46, p. 823.

Burrows, Waters F.: The cure of habitual constipation by the intra-abdominal use of oil.—Med. Rec. 1914, v. 85, p. 655–656.

Pringle, Seton S.: The internal administration of paraffin oil flavored with one of the essential oils such as cinnamon or peppermint in doses of 1 to 4 gms. three times a day has been found to give satisfactory results in the early stages of intestinal stasis.—Brit. M. J. 1914, v. 1, p. 187.

Kellogg, J. H.: The paraffin treatment of constipation. The drawbacks and disadvantages.—New York M. J. 1914, v. 100, p. 504–511. See also Bastedo, W. A.: J. Am. M. Assoc. 1914, v. 63, p. 717, and Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 154.

Philipps, Llewellyn P.: The use of liquid paraffin in enteric fever with constipation.—Lancet, 1914, v. 187, p. 231. See also Ewart, William: p. 421–422.

Dodd, Verne Adams: A dry dressing for wounds and ulcers which is especially designed to protect granulations. This dressing consists of ordinary white mosquito net which has been infiltrated with a

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mixture of paraffin and petrolatum, of each 2 parts, and stearin 1 part.—J. Am. M. Assoc. 1914, v. 62, p. 1247–1249.

PETROLATUM SAPONATUM, N. F.

Nixon, C. F.: Liquid petrox should be made by parts in volume instead of by weight.—Apothecary, 1914, v. 26, January, p. 20. See also Amos, W. S.: J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

Anon.: Formulas for linoliments, a name applied by Mindes to preparations formerly known as linogens.—Pharm. Zentralh. 1914, v. 55, p. 769.

PHENOL.

Anon.: Synthetic carbolic acid. The production of carbolic acid from benzol.—Pract. Drug. 1914, v. 32, p. 538. See also Oil, Paint & Drug Rep. 1914, v. 86, October 5, p. 11, and November 30, p. 9.

Jensen, H. R.: A sample of the synthetic phenol, 100 per cent pure, was found to melt at 40.5°. Two ordinary samples melted at 39° and 40°, respectively.—Evans's An. Notes, 1914, p. 53.

Noyes, C. R.: Crude carbolic should be bought on the percentage basis. It varies on the market from 95 per cent to 10 per cent of phenol.—Proc. Minnesota Pharm. Assoc. 1914, p. 192.

Redman, Weith and Brock: The determination of phenol in the presence of hexamethylenetetramine and formaldehyde.—J. Ind. & Eng. Chem. 1914, v. 6, p. 205–206. See also p. 7.

Redman, Weith and Brock: A rapid volumetric method for determining *o*, *m*, and *p*-cresols, thymol and phenol.—Chem. News, 1914, v. 110, p. 168–179, 176–179.

Filcher, J. D.: Note on the solubility of phenol in hydrocarbons.—Am. J. Pharm. 1914, v. 86, p. 149–150.

Essex, Harry: The volume surfaces of fluid benzol and phenol and of solid benzol, naphthalin and sodium chloride.—Ztschr. Anorg. Chem. 1914, v. 88, p. 189–233.

Hankey, William T.: Of four samples of phenol examined, one was rejected, phenol content being 85.11. The remaining three samples varied from 96.38 to 99.31 per cent.—Proc. Ohio Pharm. Assoc. 1914, p. 49.

Baker, W. L.: Crystals of phenol were found to be off color, being quite red.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Pim, Arthur A.: Carbolic acid in the treatment of tetanus; a review.—Practitioner, 1914, v. 93, p. 819. See also Brit. M. J. 1914, v. 2, p. 836, and p. 1098; also Lancet, 1914, v. 187, p. 70, p. 265, and p. 1461–1462.

Pohl, F.: Injection of phenol-camphor in the treatment of chronic arthritis must be made only into the joint, never directly into the

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blood stream.—(Zentralbl. für Chir. v. 41, No. 5) J. Am. M. Assoc. 1914, v. 62, p. 819.

Moore, J. Walker: Nitric acid and carbolic acid are the best caustic solutions for use in the treatment of chancroids.—Merck's Arch. 1914, v. 16, p. 78.

Gortner and Banta: Notes on the toxicity of dilute solutions of certain phenolic compounds as indicated by their effect on amphibean eggs and embryos, together with references on modifications of pigment development.—Biochem. Bull. 1914, v. 3, p. 357–368.

For additional references on phenol see Chem. Abstr.; Chem. Zentralbl.; Chem. Soc. Lond.; and J. Soc. Chem. Ind.

PHENOL LIQUEFICATUM.

McElhenie, Thomas D.: Phenol can be liquefied without heat and a recognition of this fact may stop some drug store fires and save the lives of some of the clerks.—N. A. R. D. Notes, 1914, v. 17, p. 1247.

Brown, L. A.: Three samples of liquefied phenol analyzed. All passed as fully meeting the requirements of the U. S. P.—Proc. Kentucky Pharm. Assoc. 1914, p. 119.

U. S. P. IX: In Unguentum Phenolis 2.25 gm. of liquefied phenol replaces 3 gm. of phenol and ointment replaces white petrolatum as the vehicle.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1579, and Abstr. Prop. Changes, Part 6, 1914, p. 17.

PHENOLPHTHALEIN.

Anon.: Phenolphthalein, simple or compound, is sold as "Aperione," "Laxans," "Laxatin," "Laxatol," "Laxatoline," "Laxiconfect," "Laxoin," "Laxophen," "Paraphthalein," "Phenolax," "Proliclin," "Purgen," "Purgo," "Purgolade," "Purgella," and "Purgylum."—Pharm. J. 1914, v. 93, p. 346.

Mirkin, A.: A new method for the determination of phenolphthalein based on its property to form a well-defined oxime with hydroxylamine.—Am. J. Pharm. 1914, v. 86, p. 307–308.

Kebler, L. F.: Outline of method for the determination of phenolphthalein in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1096.

Warren, L. E.: The detection of emodin-bearing drugs in presence of phenolphthalein.—Am. J. Pharm. 1914, v. 86, p. 444–449; also Rep. Chem. Lab. Am. M. Assoc. 1914, v. 7, p. 19–24, and p. 15.

Schestakoff and Nocken: On the constitution of bisazophenolphthalein and of the colored phenolphthalein salts.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 331–336.

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Anon.: Phenolphthalein-agar is agar-agar impregnated with phenolphthalein, 100 gms. contains 3 gm. of phenolphthalein.—J. Am. M. Assoc. 1914, v. 62, p. 1168.

Editorial: Among the newer laxatives phenolphthalein enjoys an unusual popularity. Thousands of formulas are upon the market whose efficiency is due to this agent.—New Idea, 1914, v. 36, p. 125.

Anon.: Observations on the form in which plenolphthalein is active in the human organism.—Pharm. Zentralh. 1914, v. 55, p. 184.

Hydrick, J. L.: Albuminuria following ingestion of phenolphthalein.—J. Biol. Chem. 1914, v. 17, p. xxxvi (abstr.).

White, Charles J.: Report of a case of poisoning of the skin (dermatitis medicamentosa) by phenolax.—J. Am. M. Assoc. 1914, v. 63, p. 1410.

Fanz, J. I.: Phenolsulphonephthalein renal function test. A simple technic and a method to eliminate one source of error.—New York M. J. 1914, v. 100, p. 1214–1215.

Agnew, J. Howard: Comparative study of phenolsulphonephthalein elimination and the incoagulable nitrogen of the blood in cardiorenal diseases.—Arch. Int. Med. 1914, v. 13, p. 485–496. See also Frothingham and Smillie: v. 14, p. 541–551.

Ware, Martin W.: The futility of phenolsulphonephthalein as an indicator of renal function.—New York M. J. 1914, v. 99, p. 416–420.

Hess, Otto: Experiences with the phenolsulphonephthalein method of testing kidney functioning.—Münch. med. Wchnschr. 1914, v. 61, p. 1835–1838, 1874–1878.

References to contributions by Geraghty and others.—J. H. Hosp. Bull. 1914, v. 25, p. 64.

PHENYLIS SALICYLAS.

Anon.: The manufacture of salol. An outline of the several processes involved.—Chem. & Drug. 1914, v. 85, p. 314.

Williams, Joseph H.: Phenyl salicylate is prepared by passing carbonyl chloride into a heated mixture of sodium salicylate and sodium phenate.—Pharm. J. 1914, v. 93, p. 294.

Anon.: Salicyl phenylester or phenyl salicylate is obtained by treating salicylic acid and phenol with phosphorus pentachloride or phosphorus oxychloride.—Southern Pharm. J. 1914, v. 7, p. 59.

Jones, H. W.: The assay of medicinal tablets containing salol.—Am. Druggist, 1914, v. 62, p. 369. See also Kebler, L. F.: J. Am. Pharm. Assoc. 1914, v. 3, p. 1097.

Richter, Ernst: Method for dispensing salol in the form of an emulsion by dissolving in olive oil and emulsifying the resulting solution.—Apoth.-Ztg. 1914, v. 29, p. 687.

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Bianchini, Gino: On the incompatibility existing between salol, sulphonal and betanaphthol.—Atti accad. Lincei, 1914, v. 23, p. 608–615.

Kochman, M.: Salol is a comparatively tastless product and is decomposed in the intestinal tract. It deserves to be used more extensively than is the case at the present time.—Therap. Monatsh. 1914, v. 28, p. 652.

PHOSPHORUS.

E'we and Vanderkleed: The determination of free phosphorus in rat pastes, phosphoretted resin, and phosphorus tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1684. See also Proc. Pennsylvania Pharm. Assoc. 1914, p. 277.

Heubner, Wolfgang: A discussion of the factor to be used in the determination of phosphorus by the method as outlined by Neuman.—Biochem. Ztschr. 1914, v. 64, p. 401–408. See also Arch. exper. Path. u. Pharmakol. 1914, v. 78, p. 24–82.

Raper, H. S.: The gravimetric estimation of minute quantities of phosphorus, more particularly the ether soluble phosphorus compounds of blood serum.—Biochem. J. 1914, v. 8, p. 649–655.

Bridgman, P. W.: Two new modifications of phosphorus.—J. Am. Chem. Soc. 1914, v. 36, p. 1344–1363.

Kohlschütter and Frumkin: Contribution to our knowledge of the forms of phosphorus.—Ztschr. Elektrochem. 1914, v. 20, p. 110–123.

Lundin, P. E.: Phosphorated oil and the use of liquid petrolatum as the solvent.—Pharm. Ztg. 1914, v. 59, p. 906.

Magnus, R.: A case of fatal poisoning from phosphorated cod liver oil in a child.—Vrtljschr. ger. Med. 1914, v. 47, p. 265–280.

Opie and Alford: Influence of diet on the toxicity of phosphorus.—J. Am. M. Assoc. 1914, v. 63, p. 137.

Anon.: A criticism on the introduction of amorphous phosphorus as a valuable therapeutic agent."—J. Am. M. Assoc. 1914, p. 793–794. See also p. 1033–1035.

PHYSOSTIGMA.

U. S. P. IX: Defined as the dried seeds. Description elaborated. Ash not exceeding 3 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 394, and Abstr. Prop. Changes, Part 2, 1914, p. 36.

U. S. P. IX: Modified methods of assay.—J. Am. Pharm. Assoc. 1914, v. 3, p. 995, and Abstr. Prop. Changes, Part 4, p. 12.

Ramsay, C. F.: It is difficult to extract physostigma because of its hard structure. Using a coarse powder of physostigma it is possible to obtain only from 40 to 60 per cent of the alkaloid.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1647.

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Roberts, J. G.: Two lots of calabar beans were below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 132.

Vanderkleed, C. E.: Reports seven assays of calabar bean, found to vary from 0.079 to 0.130 per cent of alkaloid; all below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

U. S. P. IX: The powdered extract to yield not less than 1.7 per cent nor more than 2.3 per cent of the alkaloids of physostigma.—J. Am. Pharm. Assoc. 1914, v. p. 1569, and Abstr. Prop. Changes, Part 6, 1914, p. 7.

U. S. P. IX: The tincture is to be assayed before being finished.—J. Am. Pharm. Assoc. 1914, v. 3, p. 547, and Abstr. Prop. Changes, Part 3, 1914, p. 24.

PHYSOSTIGMINÆ SALICYLAS.

Straus, Fritz: An experimental study of the constitution and derivatives of physostigmine.—Ann. Chem. 1914, v. 406, p. 332–341; also Apoth.-Ztg. 1914, v. 29, p. 890.

Lapicque, L. and M.: Action of various muscular poisons (alkaloids) on their absorption by muscles. A review of the action of physostigmine.—Compt. rend. Soc. biol. 1914, v. 77, p. 288–291.

PHYTOLACCA.

Henkel, Alice: An illustrated description of *Phytolacca americana* L. also known by the common names: Poke, Virginian poke, pigeon berry, garget, scoke, pocan, coakum, inkberry, red inkberry, American nightshade, cancer jalap, redweed.—Spatula, 1914, v. 20, p. 351; also Phys. Drug. News, 1914, v. 9, p. 122.

Anon.: *Phytolacca abyssinica* Hoffm., a relative to *Phytolacca dodecandra*, a poisonous saponin containing plant is used by the Zulu Kaffirs of South Africa as an active emetic, diuretic, and laxative.—Pharm. Weekblad, 1914, v. 51, p. 1111–1112, 1129–1140.

Rippetoe, J. R.: Three samples of phytolacca root were found to contain from 19.95 to 24 per cent of alcohol extract (49 per cent) and from 10.06 to 13.14 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

Maines, E. L.: Poke root was found to contain from 8.74 to 9.89 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Editorial: Phytolacca induces a reduction in the large thyroids.—Phys. Drug News, 1914, v. 9, p. 363.

Powers, R. E.: Phytolacca in adenopathy.—Eclectic M. J. 1914, v. 74, p. 405–406.

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PILOCARPINÆ HYDROCHLORIDUM.

Mann, E. W.: Commercial samples of pilocarpine usually show melting points lower than that of the pure salt. From 191° to 196° were the actual figures obtained from four samples.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 46.

Kollo, Konstantin: Ampoules of pilocarpine hydrochloride may be Tyndallized at from 90° to 100° on three separate days.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

Sogimoto, T.: The action of pilocarpine on the isolated uterus of the guinea pig is that of an irritant.—Arch. exper. Path. u. Pharmakol. 1914, v. 74, p. 39.

Robinson, W. D.: In intelligently selected cases of hypertension, pilocarpine has not failed to be of value.—J. Am. M. Assoc. 1914, v. 63, p. 349; also Merck's Arch. 1914, v. 16, p. 382–385.

For additional comments on pilocarpine see Zentralbl. Biochem. Biophys.; Zentralb. exper. Med.

PILOCARPINÆ NITRAS.

Mann, E. W.: The melting point range observed for five samples of pilocarpine nitrate was from 165° to 174°.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 46.

PILOCARPUS.

U. S. P. IX: The dried leaflets of *Pilocarpus jaborandi* or of *Pilocarpus microphyllus* with not more than 5 per cent of the rachis (stalks) bearing the leaflets. Ash not exceeding 7 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 394, and Abstr. Prop. Changes, Part 2, 1914, p. 36.

Lloyd, John Uri: The characteristics and constituents of jaborandi.—Eclectic M. J. 1914, v. 74, p. 226.

Webster, D. H.: The alkaloids of pilocarpus are contained in the epidermal layers of the leaf.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 127; also Pharm. Weekblad, 1914, v. 51, p. 231.

Caesar & Loretz: The valuation of jaborandi, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 85–86.

U. S. P. IX: To require that pilocarpus yield not less than 0.6 per cent of alkaloids. The fluid extract from 0.55 to 0.56 per 100 cc.—J. Am. Pharm. Assoc. 1914, v. 3, p. 996, and Abstr. Prop. Changes, Part 4, 1914, p. 13.

Vanderkleed, C. E.: Reports four assays of pilocarpus; from 0.303 to 0.948 per cent alkaloids; three above and one below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

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Roberts, J. G.: No trouble whatever is experienced in getting jaborandi leaves containing 0.5 per cent of alkaloids, as an examination of three samples showed them to contain 1.13 per cent, 1 per cent and 0.89 per cent, respectively.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 142.

U. S. P. IX: Fluid extract to be made from No. 30 powder. A mixture of alcohol 2 volumes and water 1 volume to be used as a menstruum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 542, and Abstr. Prop. Changes, Part 3, 1914, p. 19.

Delava, Paul: An experimental study of the ocular compression effects after the administration of morphine, chloroform, atrophine, pilocarpine, and adrenaline.—Compt. rend. Soc. biol. 1914, v. 76, p. 631–632.

Robinson, W. D.: Pilocarpine in high blood pressure.—New York M. J. 1914, v. 100, p. 918–921.

PILULÆ.

Anon.: A compilation of the more desirable excipients used in the making of pill masses for general use.—Pharm. Zentralh. 1914, v. 55, p. 413–414.

Anon.: In the Ph. Brit. V. formulas for pills the excipient sirup of glucose has replaced confection of roses.—Chem. & Drug. 1914, v. 85, p. 490.

Douglas, Theobald: Observations on the comparative usefulness of several pill masses.—Pharm. Zentralh. 1914, v. 55, p. 206.

Davenport, Robt. E.: An illustrated description of a pill mass roller.—Bull. Pharm. 1914, v. 28, p. 207. See also Pollard, E. W.: Year-Book of Pharmacy, 1914, p. 411.

Peck, E. Saville: The suggestion of a custom to insure greater uniformity in the size of pills dispensed on the same prescription.—Year-Book of Pharmacy, 1914, p. 423.

Hart, Joseph: Lycopodium is seldom necessary as a dusting powder for pills. A properly made mass does not require it, and pills are much more easily coated when a dusting powder is not used.—Pacific Drug. Rev. 1914, v. 26, March, p. 12.

PILULA FERRI CARBONATIS.

U. S. P. IX: Method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1574, and Abstr. Prop. Changes, Part 6, 1914, p. 12.

Hart, Joseph: Pills of ferrous carbonate can readily be made by triturating ferrous sulphate and potassium carbonate until the reaction is complete, omitting both glycerin and water and adding a sufficient amount of althæa and tragacanth to form a perfect pill.—Pacific Drug. Rev. 1914, v. 26, March, p. 12.

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Parkes and Major: The composition of iron pills and the examination of 18 samples, showing the variation in ash, ash insoluble in acid, and percentage of ferrous carbonate. The latter was found to vary from 8.1 to 30.2.—Pharm. J. 1914, v. 92, p. 712.

Anon.: In general there seems to be no reason why a Blaud pill made in accordance with the direction of the U. S. P. and coated with gelatin or sugar should not keep for a long time; specimens have been known to keep at least 40 years.—J. Am. M. Assoc. 1914, v. 63, p. 1315.

PILULÆ FERRI IODIDI.

U. S. P. IX: Method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1574, and Abstr. Prop. Changes, Part 6, 1914, p. 12.

Francois and Lormand: The determination of iodine in pills of ferrous iodide.—Ann. Falsif. 1914, v. 7, p. 203–209; also J. pharm. et chim. 1914, v. 9, p. 332–341.

PIMENTA.

Mann, E. W.: Ash yield on four batches of powdered pimenta ranged from 3.69 to 4.93 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 22.

Hortvet, Julius: Of 18 samples of allspice examined, 7 were reported illegal.—Rep. Minnesota D. & F. Com. 1914, p. 68.

PIPER.

U. S. P. IX: Piper may include not more than 2 per cent of stems and foreign matter. Ash not exceeding 7 per cent. Ash insoluble in diluted hydrochloric acid not exceeding 2 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 395, and Abstr. Prop. Changes, Part 2, 1914, p. 37.

Xrayser II: Pepper has a peculiar historical interest for chemists and druggists. Anciently pepper was of enormous commercial importance, being the chief of the spices.—Chem. & Drug. 1914, v. 84, p. 403.

Jensen, H. R.: The variance as to the natural proportion of adherent husk allowable in ground decorticated (i. e. "white") pepper.—Evans' An. Notes, 1914, p. 50. See also Mann, E. W.: Ann. Rep. Southall Bros. & Barclay, 1914, p. 21.

Parry, E. J.: The detection of turmeric in white pepper.—Chem. & Drug. 1914, v. 84, p. 108. See also Bell, A. E.: p. 247.

Rigotard, Marcel: The detection of olive pits in pepper.—Ann. Falsif. 1914, v. 7, p. 132–133.

Maines, E. L.: Pepper, black, was found to contain from 3.53 to 4.99 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

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Mann, E. W.: Ash in three samples of ground black pepper varied from 4.32 to 5.16 per cent.—Ann. Rep. Southall Bros & Barclay, 1914, p. 21.

Rippetoe, J. R.: One sample of white pepper was found to contain 8.60 per cent of alcohol extract and 1.11 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

Barnard, H. E.: Six samples of pepper examined; two illegal.—Rep. Indiana Bd. Health, 1912, Indianapolis, 1914, p. 432.

Hortvet, Julius: Of 77 samples of pepper examined 41 were reported illegal.—Rep. Minnesota D. & F. Com. 1914, p. 68.

U. S. P. IX: Ether to replace acetone for making the oleoresin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 551, and Abstr. Prop. Changes, Part 3, 1914, p. 28.

PIX (COAL TAR).

Sharples, Philip P.: The relation between the melting point and the viscosity of refined tar.—J. Ind. & Eng. Chem. 1914, v. 6, p. 285–286.

Jayne, D. W.: The position of the American tar distiller.—J. Ind. & Eng. Chem. 1914, v. 6, p. 952–953.

Parker, Edward W.: It has been contended that the development of the by-product coking industry would have shown more rapid progress if markets for the by-products were assured.—Oil, Paint & Drug Rep. 1914, v. 85, September 21, p. 11.

Murphy, Robert K.: A book review of two volumes on the Coal Tar and Ammonia Industry, by George Lunge and Hippolyt Köhler.—J. Ind. & Eng. Chem. 1914, v. 6, p. 1046.

Editorial: Recommendations of the New York section of the American Chemical Society on the enlargement of the coal tar chemical industry in the United States.—J. Ind. & Eng. Chem. 1914, v. 6, p. 972–975. See also Hesse, Bernhard C.: p. 1013–1027.

PLUMBI ACETAS.

Kaikow, F. J.: U. S. Patent 1,097,099 outlines a method for the production of lead salts of acetic acid.—J. Ind. & Eng. Chem. 1914, v. 6, p. 791. See also English Patent 29,048, December 16, 1913: J. Soc. Chem. Ind. 1914, v. 33, p. 256.

Jackson, Richard F.: Equilibrium in the system; lead acetate, lead oxide, water, at 25°.—J. Am. Chem. Soc. 1914, v. 36, p. 2346–2357.

Sudro, W. F.: Of 71 samples of lead acetate examined 25 were not standard, or illegal.—Rep. North Dakota Exper. Sta. 1912, p. 161–164.

Schoenfeld, Johannes: The value and significance for the lead industry of the examination of blood in cases of lead poisoning.—Ztschr. ang. Chem. 1914, v. 27, p. 313–315.

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PLUMBI OXIDUM.

Milbauer, Jaroslav: Physical, chemical, and technical study of red oxide and related oxides of lead.—Chem.-Ztg. 1914, v. 38, p. 477–479, 559–560, 566–567.

PODOPHYLLUM.

U. S. P. IX: Described as the dried rhizome and roots. Monograph elaborated. Ash not exceeding 3 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 396, and Abstr. Prop. Changes, Part 2, 1914, p. 38.

Lloyd, John Uri: Characteristics and constituents of podophyllum.—Eclectic M. J. 1914, v. 74, p. 228.

Tunmann, O.: The morphology and microchemistry of *Podophyllum peltatum* L.—Pharm. Zentralh. 1914, v. 55, p. 612–623.

Disqué, Ludwig: A contribution on the constituents and the action of podophyllum; the composition of podophyllin and methods of testing.—Pharm. Zentralh. 1914, v. 55, p. 274–275.

Anon.: Any attempts at assaying or standardizing podophyllum should be in terms of podophyllum resin, U. S. P.—Western Druggist, 1914, v. 36, p. 342.

Jenkins, W. M.: A method for the estimation of podophyllum resin.—J. Ind. & Eng. Chem. 1914, v. 6, p. 671–672; also Chem. News, 1914, v. 110, p. 129–130, 206–207.

Vanderkleed, C. E.: Reports eight assays of mandrake; from 2.67 to 5.30 per cent of resin; two above and six below standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Maines, E. L.: Mandrake was found to contain 5.42 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

U. S. P. IX: To direct the use of alcohol as a menstruum in making the fluid extract.—J. Am. Pharm. Assoc. 1914, v. 3, p. 542, and Abstr. Prop. Changes, 1914, Part 3, p. 19.

Dewees, N. M.: Elixir of podophyllum is indicated in the treatment of diabetes mellitus when there is sugar in the urine, whether the quantity of that fluid is excessive or scanty.—Nat. Eclect. M. Assoc. Quart. 1914–15, v. 5, p. 259.

See also under "Resina Podophylli."

POTASSA SULPHURATA.

Raubenheimer, Otto: Sulphurated potassa is very unstable, but the solution of this unstable chemical is very stable and can be kept for two years.—J. Am. Pharm. Assoc. 1914, v. 3, p. 692–695.

Mann, E. W.: We find much sulphurated potash in commerce to consist of a mixture of potassium and sodium salts.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 47.

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POTASSII ACETAS.

Jensen, H. R.: Five samples of potassium acetate were found to contain 1 to 2 parts of lead per million. Arsenic was practically absent.—Evans' An. Notes, 1914, p. 54.

Hill, C. A.: Of 12 samples of potassium acetate examined during the years 1910 to 1913, inclusive, the lead content varied from 1 to 4 parts per million. The arsenic content varied from 0.1 to 0.8 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

Sudro, W. F.: Of 61 samples of potassium acetate examined, 1 gave a positive test for heavy metals. Arsenic was not found in any one sample. The per cent of potassium acetate varied from 98.1 to 99.3.—Rep. North Dakota F. Com. 1914, p. 34.

POTASSII BICARBONAS.

Kebler, L. F.: Outline of method for the determination of potassium bicarbonate in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1096.

Caven and Sand: The dissociation pressures of the alkali bicarbonates. Part II. Potassium, rubidium, and cæsium hydrogen carbonates.—J. Chem. Soc. Lond. 1914, v. 105, p. 2752–2761.

Hill, C. A.: Of 80 samples of potassium bicarbonate examined during the years 1910 to 1913, inclusive, the lead content varied from 0.5 to 11 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 22. See also p. 18.

POTASSII BITARTRAS.

Mann, E. W.: The revisers of the Ph. Brit. have again raised the standard for acid potassium tartrate, 99 per cent pure bitartrate being now the minimum requirement.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 47.

Lefeldt, M.: The Ph. Germ. V test for sulphate and chloride in potassium bitartrate could be simplified.—Pharm. Ztg. 1914, v. 59, p. 43.

Hill, C. A.: Of 196 samples of acid potassium tartrate examined during the years 1910 to 1913, inclusive, the lead content varied from 12 to 50 parts per million. The arsenic content varied from 0 to 2 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

POTASSII BROMIDUM.

Hill, C. A.: Of 21 samples of potassium bromide examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 5 parts per million. The arsenic content varied from 0 to 0.8 parts per million.—Chem. & Drug. 1914, v. 85, p. 22. See also p. 18.

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Jensen, H. R.: Forty-one samples of potassium bromide were estimated to contain 99.3 to 100 per cent (average 99.5) of total halogen salts as bromide.—Evans' An. Notes, 1914, p. 54.

Finnemore and Williamson: The incompatibility of strychnine and nux vomica with alkalies, iodides, and bromides.—Brit. & Col. Drug. 1914, v. 66, p. 76–77. See also Pharm. J. 1914, v. 92, p. 124–125. For discussion see p. 153.

Becker, Henry C.: Of the alkaline bromides the potassium salt is the strongest, most stable and reliable.—Merck's Arch. 1914, v. 16, p. 35.

Lehndorff, Arno: Observations on the action of bromides on the circulation.—Arch. exper. Path. u. Pharmakol. 1914, v. 76, p. 236–238. See also Carnot and Coirre: Pharm. J. 1914, v. 93, p. 458.

Braun, Israel: Bromides are useful as antispasmodics in the treatment of bronchial asthma, but inferior to other remedies, as the patient soon gains a tolerance.—Merck's Arch. 1914, v. 16, p. 107.

Weiss, Ludwig: An unusual case of bromoderma of the leg in a female, age 24, who had taken potassium bromide for a number of years.—J. Am. M. Assoc. 1914, v. 63, p. 635–639.

POTASSII CARBONAS.

Jensen, H. R.: Sixty-three samples of potassium carbonate were found to contain: Total strength as K_2CO_3, 82 to 84 per cent: chloride, as KCl, 0.06 to 1.2 per cent; arsenic 4 parts or less per million.—Evans' An. Notes, 1914, p. 55.

Mann, E. W.: Arsenical contamination is only infrequently found. Except for two samples, one-half part per million was the maximum observed.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 46.

Kohen, W.: Chlorate was found as an unexpected contamination of potassium carbonate.—Chem.-Ztg. 1914, v. 38, p. 898.

Hill, C. A.: Of 51 samples of potassium carbonate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 2.5 parts per million. The arsenic content varied from 0 to 1.6 parts per million.—Chem. & Drug. 1914, v. 85, p. 22. See also p. 18.

POTASSII CHLORAS.

U. S. P. IX: Test for heavy metals modified and method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1574, and Abstr. Prop. Changes, Part 6, 1914, p. 12.

Kolsky, G.: U. S. Patent 1,092,369. Process for making, electrolytically, chlorates and apparatus therefor.—J. Soc. Chem. Ind. 1914, v. 33, p. 549.

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Hill, C. A.: Of 369 samples of potassium chlorate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 1.6 parts per million.—Chem. & Drug. 1914, v. 85, p. 22. See also p. 19.

Unna, Paul: A paste of potassium chlorate with chalk has been found efficient in the treatment of a variety of skin diseases of an inflammatory nature.—(Dermatol. Wchnschr. 1914, p. 1132) Apoth.-Ztg. 1914, v. 29, p. 848.

Editorial: Potassium chlorate is one of the most useful chemicals in the eclectic materia medica.—Eclectic M. J. 1914, v. 74, p. 429–430.

POTASSII CITRAS.

U. S. P. IX: To require not less than 8 per cent of anhydrous potassium citrate with small amounts of citric and carbonic acids. Formula modified; method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 531, and Abstr. Prop. Changes, Part 3, 1914, p. 8.

Jensen, H. R.: Two samples of potassium citrate containing 12 and 3 parts of arsenic per million were condemned; 20 further tests indicating the allowable amount of 1 part per million or less.—Evans' An. Notes, 1914, p. 55.

Hill, C. A.: Of 512 samples of potassium citrate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 7 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 22.

POTASSII CYANIDUM.

Blish, W. G.: Potassium cyanide has been found very effectual in killing ants in lawns, and it does its work without killing the grass.—Science, 1914, v. 40, p. 637.

POTASSII ET SODII TARTRAS.

Alwood, William B.: Crystallization of cream of tartar in the fruit of grapes with tables giving percentage by weight of acids and acid salts in Concord grapes.—J. Agric. Research, 1914, v. 1, p. 513–514.

Hill, C. A.: Of 143 samples of soda tartarata examined during the years 1910 to 1913, inclusive, the lead content varied from 3 to 12 parts per million. The arsenic content varied from 0 to 3.5 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

Post, Wilber E.: Observations on the effect of tartrates on the human kidney.—J. Am. M. Assoc. 1914, v. 62, p. 593.

Salant and Smith: The toxicity of sodium tartrate.—Am. J. Physiol. 1914, v. 35, p. 239–264, and J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 515.

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Salant, William. The pharmacology of sodium tartrate.—J. Am. M. Assoc. 1914, v. 63, p. 1076–1078, and Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 224–230.

Salant and Hecht: The influence of tartrates, citrates, and oxalates on the isolated heart.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 179.

POTASSIUM FORMATE.

Beringer, George M.: A proposed monograph for potassium formate. It should contain, when dried, not less than 98 per cent of potassium formate (KCOOH).—J. Am. Pharm. Assoc. 1914, v. 3, p. 1599.

POTASSIUM GLYCEROPHOSPHATE.

Umney and Bennett: Potassium glycerophosphate is not readily obtainable in the crystalline form. Solutions should be required to contain 75 per cent or 50 per cent of the anhydrous salt.—Pharm. J. 1914, v. 92, p. 135, and Year-Book of Pharmacy, 1914, p. 406.

Stockinger, O. L.: Potassium glycerophosphate varies greatly. Seven lots examined ranged from 63.25 to 83.3 per cent of normal potassium glycerophosphate.—Proc. Pennsylvania Pharm. Assoc. 1914, v. 154.

Dubois, G.: Potassium glycerophosphate decomposes in water more rapidly than sodium or calcium glycerophosphate and the decomposition is promoted by citric acids but is hindered by mineral acids.—Bull. Pharm. 1914, v. 28, p. 306. See also J. Ind. & Eng. Chem. 1914, v. 6, p. 127.

POTASSII HYDROXIDUM.

Fernau, Albert: The Ph. Austr. should require a minimum content of 80 per cent KOH and restrict the K_2CO_3 to 4.6 per cent.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Katayama and Ikeda: A chloroform solution of beta naphthol gives with concentrated potassium hydroxide a blue color.—J. Pharm. Soc. Japan, 1914, October, p. 1142.

U. S. P. IX: Rubric for solution of potassium hydroxide to read not less than 4.5 per cent of potassium hydroxide. Specific gravity about 1.046 at 25°. New tests for carbonate and a modified method of assay.—J. Am. Pharm. Assoc. 1914, v. 3, p. 531, and Abstr. Prop. Changes, Part 3, 1914, p. 8.

Ziefle, Adolph: Of 60 samples of solution of potassium hydroxide examined, 17 were not within 10 per cent of official strength.—Rep. North Dakota Agric. Exper. Sta. 1914, v. 150–151.

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POTASSII HYPOPHOSPHIS.

Baker, W. L.: The solubility of potassium hypophosphite was found to be not in accordance with the U. S. P.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Anon.: The hypophosphite fallacy.—J. Am. M. Assoc. 1914, v. 62, p. 1346–1347.

POTASSII IODIDUM.

Stüwe, W.: A direct iodometric method for the determination of soluble iodides.—Apoth.-Ztg. 1914, v. 29, p. 382.

Bouyer, J.: The inalterability of solutions of potassium iodide and the rapid assay of commercial potassium iodide.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 371–377.

Fernau, Albert: A freshly prepared 5 per cent solution of potassium iodide should not be colored yellow on the addition of 2 or 3 drops of sulphuric acid.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 254.

Kebler, L. F.: Outline of method for the determination of potassium iodide in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1097.

Jensen, H. R.: One hundred and fifty samples of potassium iodide from various sources were found to contain a halogen equivalent to 99.5 to 100 per cent as potassium iodide (average 99.9 per cent).—Evans' An. Notes, 1914, p. 55.

Hill, C. A.: Of 49 samples of potassium iodide examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 2.5 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem & Drug. 1914, v. 85, p. 22. See also p. 19.

E'we, G. E.: Two lots of potassium iodide examined during the year contained chlorides and bromides in slight excess, but were otherwise U. S. P. in quality.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 154.

Todd, A. R.: Two samples of potassium iodide examined were found to be adulterated.—Rep. Dairy & Food Com. Michigan, 1914, p. 176.

Carlson, C. E.: Deterioration of potassium iodide and methods for preventing it.—Svensk farm. Tidskr. 1914, v. 18, p. 565–568.

Herz, W.: The inner friction of aqueous potassium haloid salt solutions.—Ztschr. Anorg. Chem. 1914, v. 86, p. 338–340.

Wightman, Davis, Holmes, and Jones: Conductivity and viscosity of solutions of potassium iodide and of sodium iodide in mixtures of ethyl alcohol and water.—J. chim. phys. 1914, v. 12, p. 385–394.

Dunningham, A. C.: The system; ethyl ether-water-potassium iodide-mercuric iodide. Part 1. The underlying three-component

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systems.—J. Chem. Soc. Lond. 1914, v. 105, p. 368–379; also p. 724–733, and p. 2623–2639.

Finnemore and Williamson: The incompatibility of strychnine and nux vomica with alkalies, iodides, and bromides.—Brit. & Col. Drug. 1914, v. 66, p. 76–77, and Pharm. J. 1914, v. 92, p. 124–125. For discussion see p. 153.

Llewellyn, H. D.: A mixture of equal parts of hydrated wool fat and petrolatum produces a more sightly ointment than that made with benzoinated lard.—Proc. Missouri Pharm. Assoc. 1914, p. 143.

Anon.: Observations on the making of ointment of potassium iodide.—Apoth.-Ztg. 1914, v. 29, p. 167–169. See also Warnecke, G.: p. 194–195; Lorenzen, J., p. 210–211; Schneider, p. 211; and Vasterling, p. 237.

Fleissig: A note on the yellowish discoloration of ointment of potassium iodide.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 325–326.

Rupp, E.: Outline of method for the assay of ointment of potassium iodide.—Apoth.-Ztg. 1914, v. 29, p. 724; also Südd. Apoth.-Ztg. 1914, v. 54, p. 323.

Darge, P.: The determination of iodide in ointment of potassium using iron chloride as outlined in the method by Rupp and Schirmer.—Apoth.-Ztg. 1914, v. 29, p. 749–750.

Macht, D. I.: Action of the iodides on the heart and blood vessels.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 514. See also: J. H. Hosp. Bull. 1914, v. 25, p. 278–284; J. Am. M. Assoc. 1914, v. 63, p. 1325; and p. 1767–1768.

Hirsch, Edwin Frederick: An experimental study of the influence of iodine and iodides on the absorption of granulation tissue and fat-free tubercle bacilli.—J. Infect. Dis. 1914, v. 15, p. 487–500.

Grumme-Fohrde: On the danger of the internal administration of iodides in connection with the use of mercury in the eye.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 448–457.

Anon.: The iodised junket is a pleasant vehicle for potassium iodide.—Critic and Guide, 1914, v. 17, p. 117.

For additional references on potassium iodide see Chem. Abstr.; Chem. Zentralbl.; and J. Chem. Soc. Lond.

POTASSII NITRAS.

Jensen, H. R.: Seventy samples of potassium nitrate were examined, all of which were entirely free from contamination with sulphates and iron. Chlorides are almost entirely absent from the granular variety, but "crystals" usually contain 0.3 to 0.8 per cent (average 0.5) KCl.—Evans' An. Notes, 1914, p. 55.

Hill, C. A.: Of 48 samples of potassium nitrate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 3

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parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 22.

Hankey, William T.: Fifteen samples of potassium nitrate examined complied with the U. S. P. tests for purity. No sample contained more than 2 per cent of chlorides.—Proc. Ohio Pharm. Assoc. 1914, p. 44.

Findlay, Morgan, and Morris: The solubility of the nitrates of potassium, barium, and strontium, and the stability of the double nitrate of potassium and barium.—J. Chem. Soc. Lond. 1914, v. 105, p. 779–782; also Proc. Chem. Soc. 1914, v. 30, p. 73.

Braun, Israel: The inhalation of fumes of niter-paper often gives prompt temporary relief in bronchial asthma.—Merck's Arch. 1914, v. 16, p. 106.

POTASSII PERMANGANAS.

Kebler, L. F.: Outline of method for the determination of potassium permanganate in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1097.

Anon.: Standardization of potassium permanganate solution.—Pacific Pharm. 1914, v. 8, p. 113.

Rogers, Leonard: Permanganates in sloughing and tetanus infected wounds.—Brit. M. J. 1914, v. 2, p. 1055–1056.

Dyer, Isadore: The use of potassium permanganate in the treatment of pellagra.—Merck's Arch. 1914, v. 16, p. 256.

Adler, E.: A case of suicide with potassium permanganate. A woman of 37 took 10 gm. of potassium permanganate in solid form and died on the fourth day.—J. Am. M. Assoc. 1914, v. 63, p. 1511.

POTASII SULPHAS.

Hill, C. A.: Of four samples of potassium sulphate examined during the years 1912 and 1913 the lead content varied from 30 to 80 parts per million. The arsenic content varied from 0.1 to 0.4 part per million.—Chem. & Drug. 1914, v. 85, p. 22.

PRUNUS VIRGINIANA.

U. S. P. IX: To consist of the stem bark. Usually in transverse curved pieces.—J. Am. Pharm. Assoc. 1914, v. 3, p. 396, and Abstr. Prop. Changes, Part 2, 1914, p. 38.

Maines, E. L.: Wild cherry bark was found to contain from 2.48 to 4.62 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

Llewellyn, H. D.: The 1890 formula for sirup of wild cherry should be readopted.—Proc. Missouri Pharm. Assoc. 1914, p. 143.

U. S. P. IX: The sugar has been increased to 800 gm. and the glycerin reduced to 50 cc. in sirup of wild cherry. The sugar is to be

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dissolved in the percolate by agitation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1576, and Abstr. Prop. Changes, Part 6, 1914, p. 14.

PULVERES.

Curry, Gordon L.: The nine official powders should be made by every retail druggist. Not even the busy store is excused from making Seidlitz powders.—Proc. Kentucky Pharm. Assoc. 1914, p. 58.

PULVIS ACETANILIDI COMPOSITUS.

Kaiser, W. F.: The present U. S. P. formula for compound acetanilide powder is an improvement on some of those formerly in use. The quantity of sodium bicarbonate has been increased and the tartaric acid eliminated.—Proc. Wisconsin Pharm. Assoc. 1914, p. 71.

PULVIS AROMATICUS.

U. S. P. IX: Description of the microscopic characteristics added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 551, and Abstr. Prop. Changes, Part 3, 1914, p. 28.

PULVIS ANTISEPTICUS.

Anon.: A formula for an improved soluble antiseptic powder is reprinted.—N. A. R. D. Notes, 1914, v. 18, p. 1171.

PULVIS EFFERVESCENS COMPOSITUS.

Brown, Linwood A.: An outline of a method for the assay of Seidlitz powders, including the determination of the weight of the powders, the assay of blue powders, and the determination of Rochelle salts.—J. Am. Pharm. Assoc. 1914, v. 3, p. 643–644.

Todd, A. R.: Of 16 samples of Seidlitz powders examined, 4 were found to be adulterated.—Rep. D. & F. Com. Michigan, 1914, p. 176.

Todd, A. R.: Of three samples of Seidlitz powders examined, one was found to be adulterated.—Bull. Michigan D. & F. Dept. 1914, July–August, p. 26.

PULVIS GLYCYRRHIZÆ COMPOSITUS.

Parkes and Major: The composition and analysis of compound licorice powder.—Analyst, 1914, v. 49, p. 160–162.

Gibson, W. Howieson: The deficiency of sulphur in compound licorice powder may be due to an inaccuracy in analysis. Owing to the presence of organic matter the usual method of oxidation of sulphur to sulphuric acid by nitric acid will easily give low results—about 4 per cent.—Chem. & Drug. 1914, v. 85, p. 72.

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PULVIS IPECACUANUÆ ET OPII.

Gregory, William M.: The old formula for Dover's powder called for opium, ipecac, and potassium sulphate, for which last milk sugar is substituted in the newer formula. This lessens its efficiency very much.—New York M. J. 1914, v. 99, p. 884.

PYRETHRUM.

U. S. P. IX: Defined as the dried root. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 397, and Abstr. Prop. Changes, Part 2, 1914, p. 39.

QUASSIA.

U. S. P. IX: The Jamaica and Surinam quassia with distinct characteristics.—J. Am. Pharm. Assoc. 1914, v. 3, p. 397, and Abstr. Prop. Changes, Part 2, 1914, p. 39.

Maines, E. L.: Quassia chips were found to contain from 2 to 2.49 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Rippetoe, J. R.: Two samples of quassia were found to contain 3.45 and 6.34 per cent of alcohol (32 per cent) extract and 2.78 and 3.08 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

J. D. Riedel, A.-G.: Surinam quassia contained from 1.3 to 7.7 per cent of ash.—Jamaica quassia contained from 3.2 to 7.3 per cent of ash, and from 5.6 to 7 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Parker, William B.: Quassiin as a contact insecticide. A review of the literature on quassiin.—Bull. U. S. Dept. Agric. No. 165, pp. 6.

U. S. P. IX: The tincture is to be made by percolating the drug with a menstruum of alcohol 1 volume and water 2 volumes.—J. Am. Pharm. Assoc. 1914, v. 3, p. 547, and Abstr. Prop. Changes, Part 3, 1914, p. 24.

Carlson, van de Erve, Lewis and Orr: The action of the so-called stomachics or bitters on the hunger mechanism. In therapeutic quantities the bitters including quassia have no effect on the gastric tonus and the gastric hunger contractions or on the parallel sensation of hunger.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 209–218.

QUERCUS.

Anon.: An illustrated description of *Quercus robur*, L.—Chem. & Drug. 1914, v. 84, p. 512.

J. D. Riedel, A.-G.: Quercus contained from 5.1 to 7.3 per cent of ash and from 17.9 to 19.1 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 31.

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QUILLAJA.

Rippetoe, J. R.: Four samples of quillaja contained from 6.14 to 12.73 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 86, p. 441.

J. D. Riedel, A.-G.: Quillaja contained from 9.6 to 17.8 per cent of ash, from 25.4 to 37.1 per cent of extract soluble in water, and from 21.6 to 33.5 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

QUININA.

Stockinger, O. L.: All quinine samples examined were strictly U. S. P. except for a large variation in moisture content; one lot, for example, contained 10 per cent, another 20.6 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 155.

Tarugi, N.: The coefficient of the precipitability of quinine salts in saline solutions of variable concentrations.—Gaz. Chim. Ital. 1914, v. 44, p. 131–151.

Marden and Elliott: Between water, made alkaline with NH_4OH, and chloroform, the distribution coefficient of quinine was found to be very small so that three washings from 50 cc. of aqueous solution with 10 cc. portions of chloroform would nearly completely remove the quinine.—J. Ind. & Eng. Chem. 1914, v. 6, p. 933.

Broersma, R.: None of the four methods of assaying quinine and cinchona bark, submitted in competition for prize offered by the Preanger Cinchona League, was entirely satisfactory. The prize was divided between two of the competitors.—Chem. & Drug. 1914, v. 84, p. 857.

Simmonds, Charles: The estimation of strychnine in the presence of quinine.—Analyst, 1914, v. 39, p. 81–83.

Fieselmann, Sidney F.: An assay process for quinine tablets.—Am. J. Pharm. 1914, v. 86, p. 54–56; also Merck's Rep. 1914, v. 23, p. 144.

Barnard, H. E.: Three samples of quinine tablets examined; all illegal, being 32 to 60 per cent overweight.—Rep. Indiana Bd. Health, 1912, Indianapolis, 1914, p. 443, 455.

Brown, L. A.: Four samples of 3-grain quinine capsules were found to have from 4.38 to 2 grains in each capsule. This is due simply to lack of care in filling the capsules.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Lythgoe, Hermann C.: Thirty-six samples of 2-grain quinine pills were examined, 2 of which contained, respectively, 1.66 and 1.73 grains of quinine sulphate per pill; the balance contained about 2 grains per pill.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 409.

Howard, Charles D.: Three samples of quinine pills, purporting to be 2-grain, were 102, 78, and 66 per cent of the strength claimed.—Bull. New Hampshire Bd. Health, 1914, v. 3, p. 56.

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Carter, H. R.: Quinine prophylaxis for malaria.—Public Health Rep. 1914, v. 29, p. 741–749; also J. Am. M. Assoc. 1914, v. 62, p. 2042.

Orenstein, A. J.: Contribution to the study of the value of quininization in the eradication of malaria.—J. Am. M. Assoc. 1914, v. 63, p. 1931–1933.

Brooke, Roger: The general action of quinine in the treatment of amebic dysentery.—J. Am. M. Assoc. 1914, v. 62, p. 1009–1010.

Isenschmid, R.: Experimental observations on the action of quinine on body temperature of animals without theremoregulation.—Arch. exper. Path. u. Pharm. 1914, v. 75, p. 10–32.

Macht, D. I.: Action of drugs on the isolated pulmonary artery. Quinine acted as a powerful vasodilator.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 24.

Frothingham and Halliday: The effect of quinine on rabbits inoculated with rabies.—J. Med. Research, 1914, v. 30, p. 275–280. See also Editorial: Therap. Gaz. 1914, v. 38, p. 852.

Cumming, James Gordon: The quinine treatment of rabies.—J. Infect. Dis. 1914, v. 15, p. 205–208.

Breitmann, M. J.: Quinine in the treatment of syphilis.—Therap. Monatsh. 1914, v. 28, p. 504–505.

Witham, E. Wells: The occurrence of tetanus following the hypodermic and intramuscular use of quinine.—Brit. M. J. 1914, v. 2, p. 1047. See also Editorial: Chem. & Drug. 1914, v. 85, p. 788, and Editorial: New York M. J. 1914, v. 100, p. 931–932.

Ross, Ronald: Intramuscular injections of quinine; a warning.—Lancet, 1914, v. 186, p. 1003–1004. See also reply by Tresidder, A. G.: p. 1647–1648.

Postle, F. D.: In overdoses quinine will cause a flushed face, headache, ringing in the ears, impairment of sight, and confusion of thought.—Eclectic M. J. 1914, v. 74, p. 513.

Jones, Edward T.: Quinine poisoning. A personal case. The symptoms following the ingestion of 100 grains of quinine sulphate in one dose.—Lancet, 1914, v. 186, p. 277–278.

Gimlette, John D.: Notes on three cases of quinine poisoning, two of which were fatal.—Lancet, 1914, v. 186, p. 174.

Myer, Leonard: A case of quinine poisoning, not fatal.—Lancet, 1914, v. 186, p. 819.

Pecker, Henri: Accidental poisoning by dragées of quinine containing 0.5 gm. of quinine. The total amount taken did not exceed 9 gms. of quinine hydrochloride.—J. pharm, et chim. 1914, v. 9, p. 162–163. See also Underhill, Elizabeth, J. Am. M. Assoc. 1914, v. 62, p. 1396–1397; also p. 920.

For additional comments on quinine see J. Am. M. Assoc.; Index Med.; Zentralbl. Biochem. Biophys.; Zentralbl. exper. Med.

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QUININE AND UREA HYDROCHLORIDE.

Abstract: There is a certain element of danger attending the use of quinine-urea hydrochloride as a local anesthetic.—Pharm. J. 1914, v. 92, p. 368.

Herzig, Arthur J.: In nose and throat surgery quinine and urea hydrochloride has the advantage over cocaine in that it is nontoxic and hemostatic.—New York M. J. 1914, v. 99, p. 529–530.

Watson, Leigh F.: Three cases of hyperthyroidism satisfactorily treated by injections of quinine and urea hydrochloride.—J. Am. M. Assoc. 1914, v. 62, p. 126–127.

Editorial: The suggestion to use quinine urea hydrochloride in the treatment of neuralgia is in line with the satisfactory observations made in the use of this remedy as a local anesthetic.—Ellingwood's Therap. 1914, v. 8, p. 153.

QUININÆ HYDROBROMIDUM.

Anon.: Quinine hydrobromide as a pellagra cure. An abstract of an article by Dyer.—Am. J. Clin. Med. 1914, v. 21, p. 1002–1003.

QUININÆ HYDROCHLORIDUM.

Jensen, H. R.: Gravimetrically 81 per cent of quinine was found in quinine hydrochloride, and by indirect deduction from an acid estimation with alkali (phenolphthalein), 82.7 per cent.—Evans' An. Notes, 1914, p. 56.

QUININÆ SULPHAS.

Watson, G. N.: Quinine sulphate when treated with a few drops of a freshly prepared saturated alcoholic solution of alphanaphthol to which a few drops of concentrated sulphuric acid (2 drops to each cc.) have been added, gives a yellow precipitate. When the reagent is added in excess, a yellow solution is produced.—Drug. Circ. 1914, v. 58, p. 14.

E'we, G. E.: Of eight samples of quinine sulphate examined, six were effloresced, causing assays ranging from 100.8 to 104.1 per cent of the official salt. Two others assayed 99 and 99.3 per cent, due to slight excess of water.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 155.

Brown, L. A.: Three samples of quinine sulphate tablets analyzed; two passed and one adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Scoville, W. L.: The incompatibility of quinine sulphate and aspirin is probably due to the fact that quinine is changed by or-

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ganic acids into an isomeric poisonous body known as quinotoxin.—Bull. Pharm. 1914, v. 28, p. 527.

QUININE TANNATE.

Rupp, E.: Outline of method for determining the quinine content of quinine tannate.—Apoth.-Ztg. 1914, v. 29, p. 723, and Südd. Apoth.-Ztg. 1914, v. 54, p. 314.

Carter, H. R.: The insoluble salts of quinine are better borne—that is, cause less discomfort—than the soluble. The tannate is the most insoluble and is said to be the best borne.—J. Am. M. Assoc. 1914, v. 62, p. 2042.

QUININE VALERATE.

Beringer, George M.: A proposed monograph for quinine valerate, the valerate of the alkaloid quinine. On incinerating 1 gm. not more than 0.1 per cent of ash should remain.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1600.

RENNIN.

E'we, G. E.: Rennin is quite variable in milk coagulating power. Twelve of the 13 samples examined ranged from 1:16775 to 1:62000. The other sample acted in a peculiar manner.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 155.

RESINA.

U. S. P. IX: Specific gravity to read from 1.07 to 1.09 at 25°. Ash not exceeding 0.05 per cent. The alcoholic solution shows an acid reaction.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1574, and Abstr. Prop. Changes, Part 6, 1914, p. 12.

Alsberg, C. L.: Rosin and turpentine are produced annually to the value of about $50,000,000.—Oil, Paint & Drug Rep. 1914, v. 86, December 7, p. 19.

U. S. Patent 1,082,526, covers process of obtaining rosin and turpentine from wood.—J. Soc. Chem. Ind. 1914, v. 33, p. 149.

Paul, Ludwig: New melting points of colophony and their determination.—Chem. Rev. Fett u. Harz Ind. 1914, v. 21, p. 102–105.

Wolff and Scholze: The determination of colophony in varnishes, oils, and soaps.—Chem.-Ztg. 1914, v. 38, p. 369–370, 382–383.

Paul, Ludwig: The water-soluble resin acids in American rosin.—Chem. Rev. Fett u. Harz Ind. 1914, v. 21, p. 5–8, 36–39, 53–56, 78–80.

Noyes, C. R.: Powdered rosin usually contains from 25 to 50 per cent of a filler, bran, flour, etc., put in, not to adulterate it, but to overcome the difficulty of manufacture.—Proc. Minnesota Pharm. Assoc. 1914, p. 191, and J. Am. Pharm. Assoc. 1914, v. 3, p. 854.

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Köhler, John: A review of the recent work on resins, rosin, and related products.—Monit. Sci. 1914, v. 80, p. 87–114.

Finck, Julius: Solutions of rosin and of a resinous material for use in the treatment of wounds.—Münch. med. Wchnschr. 1914, v. 61, p. 1175–1178. See also Fiessler and Bossert, p. 2396; Dieterich, K., p. 2203–2204, 2455; also J. Pharm. Elsass-Lothr. 1914, v. 41, p. 297–300, and Apoth.-Ztg. 1914, v. 29, p. 914.

RESINA JALAPÆ.

U. S. P. IX: An abstract of proposed changes and new standards for the official resins.—J. Am. Pharm. Assoc. 1914, v. 3, p. 544, and Abstr. Prop. Changes, Part 3, 1914, p. 21.

Maines and Gardner: In the manufacture of resin of jalap, great care should be taken to wash out all extractive matter with both hot and cold water. If this is done properly, the resulting yield will be nonhygroscopic.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1326, and Merck's Rep. 1914, v. 23, p. 275.

RESINA PODOPHYLLI.

U. S. P. IX: To include a test for differentiating official resin from that obtained from *Podophylli emodi*. Ash not exceeding 15 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 544, and Abstr. Prop. Changes, Part 3, 1914, p. 21.

Mann, E. W.: In the Ph. Brit. V., the characters and tests for the resin of Indian podophyllin are stated to be the same as those of the resin of *Podophyllum peltatum*, and as one of the characters prescribed the resin is to be entirely or almost entirely soluble in solution of ammonia.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 52–53.

Jenkins, W. M.: A method for the estimation of podophyllum resin.—J. Ind. & Eng. Chem. 1914, v. 6, p. 671–672, and Chem. Eng. 1914, v. 20, p. 129–130, 206–207.

Jensen, H. R.: No accurate standardization of podophyllin resin is at present possible.—Evans' An. Notes, 1914, p. 53.

Rippetoe, J. R.: One sample of resin of podophyllum was found to contain 96.85 per cent of alcohol extract, 6.58 per cent of water extract, and 9.33 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

Baker, W. L.: Two lots of podophyllin were rejected; they were deficient in alcohol-soluble content and high in ash content.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

E'we, G. E.: Of the four lots of podophyllin examined, all practically answered the U. S. P. requirements. They ranged from 98.9 to 99.8 per cent alcohol soluble matter and from 0.18 to 0.86 per cent of ash.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 154.

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Roberts, J. G.: Only one of the three samples of podophyllin examined was of U. S. P. quality. One yielded an excess of ash and the other was insufficiently soluble in ether, alcohol, or chloroform and yielded an excess of ash.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 154.

Warren, L. E.: The determination of podophyllin in PoDoLax, a mixture containing phenolphthalein and senna.—Rep. Chem. Lab. Am. M. Assoc. 1914, v. 7, p. 18.

RESINA SCAMMONII.

U. S. P. IX: Resin of scammony should be free from guaiac, jalap, rosin, or resin of false scammony.—J. Am. Pharm. Assoc. 1914, v. 3, p. 544, and Abstr. Prop. Changes, Part 3, 1914, p. 21.

Mann, E. W.: The scammony resin now official may be derived either from true scammony or Orizaba jalap, and we presume that the standard inserted for ether solubility is placed at so low a figure as 75 per cent in order to admit the resin from Orizaba jalap.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 53. See also Chem. & Drug. 1914, v. 85, p. 490.

Jensen, H. R.: One sample of scammony resin, possibly derived from Orizaba root, which, however, only yielded the exceptionally low amount of 8.1 per cent resin, had acid value, 17.5; saponification value, 194.5; ester value, 177; iodine value, 35.9.—Evans' An. Notes, 1914, p. 60.

Roberts, J. G.: Scammony resin was marked "U. S. P.," but upon subjecting it to the ether solubility test, we found that it was only 49.5 per cent soluble.—Proc. Pennsylvania Pharm Assoc. 1914, p. 156.

E'we and Vanderkleed: Occurrence of guaiac resin in scammony resin. The U. S. P. test for guaiac should be repeated under resin of scammony.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1683.

RESORCINOL.

Anon.: The Ph. Brit. V. includes Resorcinum, synonym resorcinol.—Chem. & Drug. 1914, v. 85, p. 487.

Williams, Joseph H.: Outline of method for making resorcin.—Pharm. J. 1914, v. 93, p. 294. See also Southern Pharm. J. 1914, v. 7, p. 61.

Williams, Ed. E.: In making resorcin ointment use anhydrous wool fat instead of the hydrous and use the water necessary to hydrate the wool fat to dissolve the resorcin.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Heiser, Victor G.: Report of two cases of leprosy with apparent cure following treatment by a mixture of chaulmoogra oil, resorcin, and camphorated oil.—Public Health Rep. 1914, v. 29, p. 21–22.

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Gortner and Banta: Resorcinol in 0.05 to 0.01 per cent concentration is fairly toxic to amphibian eggs and embryos.—Biochem. Bull. 1914, v. 3, p. 367.

RHAMNUS PURSHIANA.

U. S. P. IX: The dried bark of the trunk and branches of *Rhamnus purshiana*. Description elaborated. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 397, and Abstr. Prop. Changes, Part 2, 1914, p. 39.

Gathercoal, E. N.: A criticism of the chemical tests for frangula and rhamnus purshiana as proposed for the new U. S. P.—J. Am. Pharm. Assoc. 1914, v. 3, p. 982–983.

Johnson and Hindman: Rhamnus purshiana; its history, growth, methods of collection, and bibliography; with illustrations.—Am. J. Pharm. 1914, v. 86, p. 387–413. See also Am. Druggist, 1914, v. 62, p. 90.

Farwell, Oliver A.: The medullary ray cells in *Rhamnus purshiana* and in *Rhamnus californica*.—J. Am. Pharm. Assoc. 1914, v. 3, p. 649–650.

Warren, L. E.: The detection of emodin-bearing drugs in the presence of phenolphthalein.—Am. J. Pharm. 1914, v. 86, p. 444–449, and Rep. Chem. Lab. Am. M. Assoc. 1914, v. 7, p. 19–24.

Linke, H.: The Ph. Germ. V. requires at least 24 per cent of extract and permits not exceeding 6 per cent of ash. The method of determining extract content should be outlined.—Apoth.-Ztg. 1914, v. 29, p. 539.

Rippetoe, J. R.: Three samples of cascara sagrada were found to contain from 22.20 to 25.69 per cent of alcohol extract and from 26.97 to 28.05 per cent of water extract.—Am. J. Pharm. 1914, v. 86, p. 437.

Maines, E. L.: Cascara sagrada was found to contain 4.70 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Mann, E. W.: Water soluble matter in 25 samples of cascara sagrada ranged from 21.6 to 27.6 per cent, with an average of 24.4 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 10.

J. D. Riedel, A.-G.: Cascara sagrada contained from 4.8 to 8.7 per cent of ash, and from 29.5 to 32.4 per cent of extract soluble in 3 parts alcohol and 7 parts water.—Riedel's Berichte, 1914, p. 31.

Gathercoal, E. N.: A sample of bark found as an adulterant of cascara had all the earmarks of a cherry bark, and as on maceration in water a slight odor of hydrocyanic acid was observed it probably was from a species of cherry.—J. Am. Pharm. Assoc. 1914, v. 3, p. 151.

U. S. P. IX: One gm. of the powdered extract to represent 3 gm. of the drug. Dried starch to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 534, and Abstr. Prop. Changes, Part 3, 1914, p. 11.

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Becker, I. A.: The commercial powdered extract of cascara sagrada is usually claimed to be four times the strength of the drug and there is no good reason why the Pharmacopœia should direct that this preparation should be only three times the strength of the drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1024, and Nat. Druggist, 1914, v. 44, p. 419.

U. S. P. IX: The fluid extract to be made by extracting the drug with water; percolate to be evaporated to 750 cc. and 250 cc. of alcohol added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 541, and Abstr. Prop. Changes, Part 3, 1914, p. 18.

Helch, Hans: Identity reactions for the constituents of cascara would be desirable to distinguish the fluid extract of cascara from the fluid extract of frangula.—Pharm. Post, 1914, v. 47, p. 573.

U. S. P. IX: New formula for aromatic fluid extract of cascara sagrada.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1569–1570, and Abstr. Prop. Changes, Part 6, 1914, p. 7–8.

Maines and Gardner: Suggestions for making aromatic fluid extract of cascara sagrada.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1326, and Merck's Rep. 1914, v. 23, p. 274–275.

E'we and Vanderkleed: Aromatic fluid extract of cascara sagrada was found to dissolve lead and also to form precipitates containing lead.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1685.

Smith, Ernest R.: The proposed fluid glycerate of cascara sagrada seems to be of good quality and the drug is entirely exhausted of its desirable constituents. The aromatic fluid glycerate of cascara sagrada is an excellent preparation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 324.

Burrell, Thos.: A formula for elixir cascara B. P. C., which obviates the difficulty of dissolving the ammoniated glycyrrhizin.—Pharm. J. 1914, v. 92, p. 558.

Chistoni, Alfredo: On the purgative action of the glucosides of cascara sagrada when introduced hypodermically; with reports on animal experiments.—Arch. farmacol. sper. 1914, v. 17, p. 99–123.

RHEUM.

U. S. P. IX: The characteristics of several forms of rheum are described. Monograph elaborated. Ash not exceeding 13 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 398, and Abstr. Prop. Changes, Part 2, 1914, p. 40.

Editorial: The medicinal rhubarbs do well in California.—Pacific Pharm. 1914, v. 7, p. 207.

Anon.: Rhubarb is chiefly purchased for the trade at the town of Hankow on the upper Yangtse, the yearly export amounting to nearly 700,000 pounds.—Meyer Bros. Drug. 1914, v. 35, p. 292.

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Rosenthaler and Kiene: The microscopical characteristics of a new variety of Chinese rhubarb, probably Chinese or Asiatic specimens of rhapontic rhubarb.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 234–243.

Caesar & Loretz: The valuation of rhubarb, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 98–100.

Rosenthaler, L.: Observations on the drying of rhubarb. The absence of converted starch in the dried drug suggests that the drying has been at a moderately low temperature.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 405–406.

Gehe & Co.: The differentiation of official rhubarb from the rhapontic root by microscopic means is not satisfactory. The difficulty may be overcome by the proposition to determine the presence of rhaponticin.—Handelsbericht, 1914, p. 115–116, and Südd. Apoth.-Ztg. 1914, v. 54, p. 239.

Juillet: The detection of *Rheum rhaponticum* in powdered Chinese rhubarb depends on the detection of rhaponticin, a glucoside that does not occur in the latter drug.—Apoth.-Ztg. 1914, v. 29, p. 872, and abstract, Pharm. Era, 1914, v. 47, p. 555.

Maines, E. L.: Rhubarb root, granular, was found to contain from 5.93 to 9.21 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Rippetoe, J. R.: Eight samples of rhubarb were found to contain from 37.70 to 44.45 per cent of alcohol (78 per cent) extract, and from 5.28 to 8.27 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 441.

J. D. Riedel, A.-G.: Rhubarb contained from 7.1 to 12.8 per cent of ash and from 46.6 to 51 per cent of extract soluble in 1 part alcohol and 1 part water.—Riedel's Berichte, 1914, p. 33.

Mann, E. W.: Ash yield for a number of batches of powder of varying grades of rhubarb from our mills ranged from 6.1 to 9.1 per cent, in no case approaching the Ph. Brit. maximum of 15 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 22.

Bailey, E. Monroe: Some reactions of chrysophanic acid with reference to its detection in complex medicinal preparations.—J. Ind. & Eng. Chem. 1914, v. 6, p. 320–321.

Warren, L. E.: The detection of emodin-bearing drugs in presence of phenolphthalein.—Am. J. Pharm. 1914, v. 86, p. 444–449, and Rep. Chem. Lab. Am. M. Assoc. 1914, v. 7, p. 19–24.

U. S. P. IX: One gm. of the powdered extract to represent 2 gm. of the drug. Magnesium oxide and dried starch to be used as the diluent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 537, and Abstr. Prop. Changes, Part 3, 1914, p. 14.

U. S. P. IX: A description of the microscopic appearance of the constituents of compound rhubarb powder.—J. Am. Pharm. Assoc. 1914, v. 3, p. 552, and Abstr. Prop. Changes, Part 3, 1914, p. 29.

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U. S. P. IX: In making tincture of rhubarb 30 gm. of cardamom seed to replace 40 gm. of cardamom, U. S. P. VIII. The first menstruum to consist of a mixture of glycerin, alcohol, and water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 547, and Abstr. Prop. Changes, Part 3, 1914, p. 24.

U. S. P. IX: The aromatic tincture of rhubarb to be assayed before being finished.—J. Am. Pharm. Assoc. 1914, v. 3, p. 547, and Abstr. Prop. Changes, Part 3, 1914, p. 24.

Sayre, Edward A.: In making the official mixture of rhubarb and soda the mixture should be allowed to stand for three or four days, then strained through muslin or a straining cloth.—Proc. New Jersey Pharm. Assoc. 1914, p. 80. See also Hommell, Philemon E.: Merck's Rep. 1914, v. 23, p. 27–28.

Williams, Ed. E.: Mixture of rhubarb and soda, U. S. P., and mixture of rhubarb compound, N. F., are nearly identical preparations—one is about one-third stronger than the other. One of these preparations is superfluous and should be dismissed.—Proc. Wisconsin Pharm. Assoc. 1914, p. 22.

Smith, Ernest R.: The proposed fluid glycerate of rhubarb is a thick, clear, brownish-black liquid, free from sediment, and has the appearance of an excellent preparation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 325.

RHUS GLABRA.

Henkel, Alice: An illustrated description of *Rhus glabra* L.—Spatula, 1914, v. 20, p. 408, and Phys. Drug. News, 1914, v. 9, p. 155.

Beringer, George M., jr.: Of six samples of sumach berries examined one showed the characteristic long hairs of *Rhus typhina;* one was a very poor sample of *Rhus glabra;* the remaining four were true to the name.—Proc. New Jersey Pharm. Assoc. 1914, p. 111.

Rippetoe, J. R.: One sample of sumach berries was found to contain 10.59 per cent of alcohol (49 per cent) extract and 2.09 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

ROSA GALLICA.

Anon.: An illustrated description of the flowering branch of *Rosa canina.*—Chem. & Drug. 1914, v. 84, p. 888.

Maines, E. L.: Red rose leaves were found to contain from 3.27 to 4.06 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

J. D. Riedel, A.-G.: Rose contained from 4 to 5.6 per cent of ash and from 42.3 to 46.9 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

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RUBUS.

Henkel, Alice: An illustrated description of *Rubus occidentalis*, L. and *Rubus strigosum* Michx.—Phys. Drug. News, 1914, v. 9, p. 153, and Spatula, 1914, v. 20, p. 352.

Burmeister. H.: Some practical points in the technic of preparing raspberry juice.—Pharm. Zentralh. 1914, v. 55, p. 1031–1033.

SABAL.

U. S. P. IX.: The partially dried ripe fruit of *Serenoa serrulata.*—J. Am. Pharm. Assoc. 1914, v. 3, p. 399, and Abstr. Prop. Changes, Part 2, 1914, p. 41.

Henkel, Alice: An illustrated description of *Serenoa serrulata* (Michx.) Hook.—Phys. Drug. News, 1914, v. 9, p. 121, and Spatula, 1914, v. 20, p. 284.

Maines, E. L.: Saw palmetto berries dried were found to contain from 1.81 to 3.07 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Rippetoe, J. R.: One sample of saw palmetto was found to contain 20.26 per cent of alcohol extract and 30.5 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 442.

Beringer, George M, jr.: Two samples of saw palmetto berries were received. One was very hard and dry—either very old stock or immature fruit, or both. The other was soft and oily, as it should be when in prime fresh condition.—Proc. New Jersey Pharm. Assoc. 1914, p. 111.

U. S. P. IX: Fluid extract of sabal to be made from the drug in No. 20 powder and a mixture of alcohol 4 volumes and water 1 volume to be used as a menstruum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

SABINA.

Anon.: An illustrated description of *Juniperus sabina* L.—Chem. & Drug. 1914, v. 84, p. 141.

Lilly, J. K.: Savin has been replaced in several shipments by other species of juniper. True savin can only be identified by careful microscopic examination.—Proc. N. W. D. A. 1914, p. 263, Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 35.

SACCHARUM.

Williams, Ed. E.: Sugar of the U. S. P. should be the grade commercially known as Confectioners' Crystal A. This makes a sirup absolutely colorless and brilliantly clear.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

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Anon.: The word "candy" is of oriental origin and means simply sugar.—Montreal Pharm. J. 1914, v. 25, p. 19–20.

Licht, Otto: The total production of sugar, with tables showing the total trade in crude sugar in various parts of the world during the years 1903 to 1913, inclusive.—Tropenpflanzer, 1914, v. 18, p. 160–165.

Wagner, T. B.: The origin of the beet sugar industry in Europe.—J. Ind. & Eng. Chem. 1914, v. 6, p. 71.

von Lippmann, Edmund O. L.: A review of progress in the manufacture of beet sugar during the year 1913.—Chem.-Ztg. 1914, v. 38, p. 97–100.

Wagner, T. B.: The first beet sugar factory was built in Germany in 1801.—Oil, Paint & Drug Rep. 1914, v. 85, February 2, p. 35.

Backer, H. J.: The first Dutch beet sugar factory, 1811-1814.—Chem. Weekblad, 1914, v. 11, p. 940–943.

Browne, C. A.: A book review of a volume on Plantation White Sugar Manufacture, by W. H. Th. Harloff and H. Schmidt, translated from the second revised Dutch edition by James P. Ogilvie.—J. Ind. & Eng. Chem. 1914, v. 6, p. 175.

Meyer, H. C.: Strontium in the beet sugar industry.—J. Ind. & Eng. Chem. 1914, v. 6, p. 1036–1037.

Alsberg, Carl L.: Pure cane sugar is being prepared for use in determining the polariscopic standards for cane sugar. Cane sugar has been estimated by means of an enzyme from yeast.—Am. Food J. 1914, v. 9, p. 22.

Bates and Phelps: Influence of atmospheric conditons in the testing of sugars.—Bull. Bur. Standards, 1914, v. 10, p. 537–555; also Dept. Com. Bur. Stand. Sc. Papers No. 221, and J. Washington Acad. 1914, v. 4, p. 317–318.

Browne, C. A.: A book review of a volume on Sugar Analysis.—J. Ind. & Eng. Chem. 1914, v. 6, p. 526.

Burrows, G. J.: The inversion of sucrose by acids in water-alcohol solutions.—J. Chem. Soc. Lond. 1914, v. 105, p. 1260–1270, and Chem. News, 1914, v. 110, p. 126.

Bourquelot and Bridel: Action of invertase on sucrose in methyl and in ethyl alcohol of different strengths.—J. pharm. et chim. 1914, v. 9, p. 321–327.

Rossi, G.: The influence of glycerin on the alcoholic fermentation and inversion of sugar.—Boll. chim.-farm. 1914, v. 53, p. 657–659.

Boysen-Jensen, P.: The decomposition of sugar in the course of alcoholic fermentation.—Biochem. Ztschr. 1914, v. 58, p. 451–466.

Powell, C. W. P.: The viscosity of sugar solutions.—J. Chem. Soc. Lond. 1914, v. 105, p. 1–23. See also Green, Heber, Proc. Chem. Soc. 1914, v. 30, p. 158.

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Kluyver, A. J.: The determination of sugar in confitures and analogous substances by chemical and by biological methods.—Compt. rend. Congr. Internat. Pharm. 1913, v. 2, p. 1032–1046.

Rakshit, Jitendra Nath: Estimation of sucrose in the presence of lactose.—J. Ind. & Eng. Chem. 1914, v. 6, p. 307–308.

Haskell, Chas. C.: The comparative value of various sugars in the feeding of infants.—Lilly Sci. Bull. 1914, Ser. 1, p. 136–150.

Harry, Philip A.: The use of sugar in ozena, applied in the form of powder.—Prescriber, 1914, v. 8, p. 15–16.

Lo Monaco, Domenico: The action of sugar on the secretions.—Arch. farmacol. sper. 1914, v. 17, p. 127–144, 145–177.

Blosser, Roy: Preliminary report on the possible harmful effects of certain sugar cane products.—J. Am. M. Assoc. 1914, v. 63, p. 481–482.

Abderhalden and Wildermuth: A further study of the behavior of blood serum toward cane sugar before and after the parenteral introduction of this di-saccharine.—Ztschr. physiol. Chem. 1914, v. 90, p. 388–418. See also Abderhalden and Grigorescu, p. 419–436.

Editorial: The therapeutic uses of sugar.—Med. Rec. 1914, v. 86, p. 339.

For additional references on sugar see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Am. M. Assoc.

SACCHARUM LACTIS.

Fernau, Albert: The resorcin hydrochloric-acid test is too delicate when heating is continued for five minutes. The concentrated sulphuric-acid test for cane sugar is preferred.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 263.

Rakshit, Jitendra Nath: Estimation of sucrose in the presence of lactose.—J. Ind. & Eng. Chem. 1914, v. 6, p. 307–308.

Feder, E.: The determination of milk sugar in milk by means of the polariscope.—Ztschr. unters. Nahr. u. Genussm. 1914, v. 28, p. 20–29.

Thoms, H.: A study of some lactose formaldehyde combinations and the patents claimed on the production from these compounds.—Arb. Pharm. Inst. Univ. Berl. 1914, p. 210–234.

Rosemann, R.: The influence of ammonium sulphate on the specific rotatory power of milk sugar.—Ztschr. physiol. Chem. 1914, v. 89, p. 133–140.

Mayer, Joseph L.: The ash content of 15 samples of milk sugar varied from 0.17 to 0.24 per cent.—Proc. New York Pharm. Assoc. 1914, p. 115.

Panzer, Theodor: The occurrence of a diastatic substance in milk sugar.—Ztschr. physiol. Chem. 1914, v. 93, p. 316–336.

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Haskell, Chas. C.: The comparative value of various sugars in the feeding of infants.—Lilly Sci. Bull. 1914, Ser. 1, p. 136–150.

Hoffmann ,Ernst: The tolerance to galactose in the normal and during the menstruation. Report of experimental work.—Ztschr. exper. Path. u. Therap. 1914, v. 16, p. 337–364.

SAFROLUM.

Schimmel & Co.: Our output of safrol, which runs into hundreds of thousands of kilos has continued to be in brisk demand.—Semi-Ann. Rep. April, 1914, p. 118.

Jensen, H. R.: Seven samples of the best commercial safrol gave: Specific gravity, 1.1015 to 1.105; refractive index, 1.5366 to 1.5386; optical rotation, 0°.—Evans's An. Notes, 1914, p. 59.

Mann, E. W.: Four specimens of this phenol ether gave: Specific gravity, from 1.102 to 1.105; optical rotation, from +0.25° to −0.25°; refractive index, from 1.5373 to 1.5392.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 39.

Albright, Alan R.: The hydrogen number of safrol was found to be 135.6; the per cent of active constituent, 100.—J. Am. Chem. Soc. 1914, v. 36, p. 2202.

Albright, Alan R.: The reduction of safrol in determining the hydrogen number of some essential oils and essential oil products.—J. Am. Chem. Soc. 1914, v. 36, p. 2195.

Foulds and Robinson: Some derivatives of safrol.—J. Chem. Soc. Lond. 1914, v. 105, p. 1963–1972.

SALTS.

Amos, W. S.: The granulated salts appear to be somewhat out of line with those in common demand.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

Alsberg, C. L.: Opinion regarding the labeling of mineral water salts for medicinal use.—S. R. A.-Chem. 1914, p. 3–4.

SALICINUM.

Anon.: An illustrated description of *Salix alba*.—Chem. & Drug. 1914, v. 84, p. 442.

Anon.: The use of the willow, now of so much importance as the source of salicin, in medicine.—Nat. Druggist, 1914, v. 44, p. 514.

E'we, G. E.: One lot of salicin left a residue of 0.1 per cent on ignition, was slightly pinkish yellow in color, but otherwise U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 155.

Jensen, H. R.: Three samples of salicin of normal purity were found to melt from 197° to 200°.—Evans' An. Notes, 1914, p. 59.

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Kebler, L. F.: Outline of method for the determination of salicin in compound tablets containing ammonium salicylate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1086.

SALVIA.

Hommell, P. E.: The nature and composition of the leaves of *Salvia officinalis* and some of the pharmaceutical uses to which they have been put.—Proc. New Jersey Pharm. Assoc. 1914, p. 75–78.

Lefeldt, M.: The Ph. Germ. V. should require that sage leaves have a characteristic odor.—Pharm. Ztg. 1914, v. 59, p. 42.

J. D. Riedel, A.-G.: Salvia contained from 5.6 to 8.3 per cent of ash and from 30 to 35.3 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

SANGUINARIA.

U. S. P. IX: The dried rhizome and roots of *Sanguinaria canadensis*. Description elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 399, and Abstr. Prop. Changes, Part 2, 1914, p. 41.

Hankey, William T.: One lot of whole bloodroot showing a white fracture was rejected.—Proc. Ohio Pharm. Assoc. 1914, p. 54.

Maines, E. L.: Bloodroot was found to contain from 5.27 to 7.42 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Vanderkleed, C. E.: Report of 11 assays of sanguinaria; from 3.28 to 6.84 per cent alkaloids; all above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Scoville, W. L.: Five lots of bloodroot yielded from 4.1 to 6 per cent ether soluble alkaloids.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Orrick, W. H.: Sanguinarine nitrate continues to test very low. Four lots examined during the year assayed 20.8, 61.1, 47, and 44.3 per cent, respectively, of pure sanguinarine nitrate.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 155.

Ramsay, C. F.: In making fluid extract of sanguinaria, the best results were obtained by using 71 per cent alcohol, with about 2 per cent of hydrochloric acid, and having the drug coarsely powdered.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1648.

U. S. P. IX: For tincture of sanguinaria 10 cc. of hydrochloric acid replaces the 20 cc. of acetic acid.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1577, and Abstr. Prop. Changes, Part 6, 1914, p. 15.

Editorial: American sanguinaria, or bloodroot, is a tonic and stimulant to the bronchial membranes, much neglected because it has been given in too large doses.—Phys. Drug. News, 1914, v. 9, p. 363.

SANTALUM RUBRUM.

Maines, E. L.: Red saunders was found to contain from 1.04 to 1.15 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

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Cain, Simonsen, and Smith: Researches on santalin.—Proc. Chem. Soc. 1914, v. 30, p. 132; also J. Chem. Soc. Lond. 1914, v. 105, p. 1335–1342.

SANTONICA.

Gehe & Co.: Table showing the variations in the price of santonica during the years 1888–1913, inclusive.—Handelsbericht, 1914, p. 158–159.

Westling, R.: A pharmacognostic discussion of santonica.—Svensk farm. Tidskr. 1914, v. 18, p. 297–300.

Van Os, D.: Observations on santonin-free santonica, including a review of some of the recent publications on the subject.—Pharm. Weekblad, 1914, v. 51, p. 1154–1156; also Apoth.-Ztg. 1914, v. 29, p. 867; Pharm. Zentralh. 1914, v. 55, p. 208–209, and J. Am. Pharm. Assoc. 1914, v. 3, p. 1289.

Caesar & Loretz: The presence of plant hairs at the base of the involucrum of santonica is indicative of adulteration. The genuine flowering bud is devoid of such hair.—Jahres-Ber. 1914, p. 24; also Pharm. Zentralh. 1914, v. 55, p. 518.

Gehe & Co.: The increase in the occurrence of santonin-free santonica makes the detection of this adulterant a matter of importance. The localization of santonin by means of the microscope is described as an efficient test.—Südd. Apoth.-Ztg. 1914, v. 54, p. 239.

Caspari, Charles E.: Tons of spurious santonica are being used all over the country, especially for stock powders, which are absolutely worthless.—J. Am. Pharm. Assoc. 1914, v. 3, p. 637.

Eldred, F. R.: Of 10 samples of santonica examined, 9 showed no trace of santonin whatever.—J. Am. Pharm. Assoc. 1914, v. 3, p. 637.

Caesar & Loretz: Six samples of true santonica contained from 1.32 to 2.73 per cent of santonin.—Jahres-Ber. 1914, p. 38.

J. D. Riedel, A.-G.: Santonica contained from 7.1 to 9.4 per cent of ash and from 13.2 to 15.3 per cent of extract soluble in ether.—Riedel's Berichte, 1914, p. 31.

Rippetoe, J. R.: Three samples of santonica were found to contain from 22.30 to 25.10 per cent of alcohol extract and from 8.50 to 10.25 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 442.

Fernau, Albert: A method for the determination of santonin in santonica should be included in the Ph. Austr.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 253.

Caesar & Loretz: The Katz-Fromme method of assay for santonica.—Jahres-Ber. 1914, p. 79–81.

Caspari, Charles E.: Determination of santonin in santonica. The method of Fromme is superior to that of either Thaeter or Katz.—J. Am. Pharm. Assoc. 1914, v. 3, p. 634–637.

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SANTONINUM.

Editorial: The study of santonin. A review of the economic conditions and the fluctuations in the price of the product.—Brit. & Col. Drug. 1914, v. 65, p. 17–18. See also: Pharm. J. 1914, v. 93, p. 2.

Lowe, Clement B.: The large quantities of crude santonin which are being imported into this country suggest the possibility that santonin-free santonica may have been treated in some way for the production of this crude santonin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 637.

Jensen, H. R.: Twenty-four samples of santonin tested were all practically pure, the melting points being almost uniform, viz, 170.5° to 171.5°.—Evans' An. Notes, 1914, p. 60.

Mann, E. W.: Fifteen samples of santonin tested have all proved satisfactory, melting points observed ranging from 168° to 172°.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 47.

Caspari, Charles E.: Determination of santonin in santonica. The method of Fromme is recommended.—J. Am. Pharm. Assoc. 1914, v. 3, p. 634–637.

Rupp, E.: Modified method for the determination of santonin in pastilles.—Südd. Apoth.-Ztg. 1914, v. 54, p. 322, and Apoth.-Ztg. 1914, v. 29, p. 723.

Gusmano, G.: The oxidation of santonin by means of organic peroxides.—Rend. soc. chim. ital. 1914, v. 6, p. 1.

Anon.: A note on the pharmacologic properties of two santonin derivatives, alpha and beta santonan.—Pharm. Zentralh. 1914, v. 55, p. 846.

Magri, E.: Fatal case of santonin poisoning. A boy of 7.—(Gazz. degli Ospedali et delle Cliniche, 1914, v. 35, No. 16) J. Am. M. Assoc. 1914, v. 62, p. 892.

Editorial: Death is frequently reported from comparatively small doses of santonin. One grain, for children 7 years old, repeated each day for five or six days, is about the maximum to be used with safety.—Ellingwood's Therap. 1914, v. 8, p. 236.

SAPO.

Thurston, Azor: Castile soap as a synonym for Sapo, U. S. P. A ruling to this effect would be desirable.—Drug. Circ. 1914, v. 58, p. 331–332.

Editorial: The list of soap-using countries is headed by the United Kingdom with 21 pounds to the individual. The United States comes next, and Russia is last with 2 pounds of soap per annum for each individual.—Am. Perf. 1914, v. 9, p. 130.

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Thomssen, E. G.: The soap-making industry. Continued from v. 8.—Am. Perf. 1914, v. 9, p. 9–11, 48–50, 76–77, 112–113, 137–138, 165–166, 193–194, 215–216, 243–244, 272–273, 297–298, 324–325.

Holde, D.: The soap, glycerin, and oil industry in the United States.—J. Ind. & Eng. Chem. 1914, v. 6, p. 45.

Anon.: A book review describes a volume on medicinal soaps, their production and uses, by Walter Schrauth.—J. Soc. Chem. Ind. 1914, v. 33, p. 378.

Herbig, W.: Progress in the chemistry of soap and its manufacture.—Chem. Rev. Fett u. Harz Ind. 1914, v. 21, p. 213.

Mann, E. W.: Much of the hard soap offered is prepared from fats other than olive oil.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 48.

Noyes, C. R.: The castile soap you buy is manufactured from a compound of olive oil and may contain a large quantity of water unless you order "Soap, U. S. P."—J. Am. Pharm. Assoc. 1914, v. 3, p. 853; also Proc. Minnesota Pharm. Assoc. 1914, p. 189.

Besson, A. A.: The determination of the fatty acid content of soaps.—Chem.-Ztg. 1914, v. 38, p. 645–647, 686–687. See also Rupp, E.: Apoth.-Ztg. 1914, v. 29, p. 724.

Bosshard and Huggenberg: The determination of free alkalies in soaps.—Apoth.-Ztg. 1914, v. 29, p. 102–103.

E'we, G. E.: The amount of moisture in five lots of castile soap examined was much less in each than the 36 per cent allowed by the U. S. P. The samples ranged from 12.6 to 22.3 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 156.

Jensen, H. R.: Eighteen samples of white castile soap in which foreign oils were not detected contained from 22.2 to 28.4 per cent of water and melted at from 22° to 27°.—Evans' An. Notes, 1914, p. 64.

Mayer, Joseph L.: Of 12 samples of castile soap 11 were found to be genuine.—Proc. New York Pharm. Assoc. 1914, p. 115.

E'we, G. E.: All samples of powdered castile soap examined were free from animal fats.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 156.

Linke, H.: The commercial samples of soap do not comply with the phenolphthalein test of the Ph. Germ. V.—Apoth.-Ztg. 1914, v. 29, p. 694.

Bosshard and Huggenberg: The determination of free alkali in soaps.—Ztschr. ang. Chem. 1914, v. 27, p. 456. See also Schweiz. Apoth.-Ztg. 1914, v. 52, p. 597–598.

Dück: A sample of soap was found to have a dark yellowish color and a rancid odor.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 235.

Bunbury and Martin: Studies on the constitution of soap solutions.—J. Chem. Soc. Lond. 1914, v. 105, p. 417–435. See also McBain

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and Martin, p. 957–977, and Proc. Chem. Soc. 1914, v. 30, p. 8 and p. 68.

For additional references on soap see Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.; J. Soc. Chem. Ind.

SAPO MOLLIS.

U. S. P. IX: Slight changes in the directions for making.—J. Am. Pharm. Assoc. 1914, v. 3, p. 550, and Abstr. Prop. Changes, Part 3, 1914, p. 27.

Roberts, J. G.: The total fatty acids of three samples of soft soap ranged from 30.98 to 46.49 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 156.

Rupp, E.: Modified method for the determination of the fatty acid content of soft soap. The Ph. Germ. V. method gives only approximate values.—Südd. Apoth.-Ztg. 1914, v. 54, p. 322.

Mann, E. W.: The majority of the soft soaps examined have given results in accordance with their description as olive oil soaps.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 48. See also Jensen, H. R.: Evans' An. Notes, 1914, p. 64.

Koch, F.: Systematic inunctions with green soap.—Therap. Monatsh. 1914, v. 28, p. 661–663. See also abstract: J. Am. M. Assoc. 1914, v. 63, p. 1989.

SARSAPARILLA.

U. S. P. IX: Mexican, Honduras, Para, and Jamaica sarsaparilla described separately. Ash not exceeding 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 400, and Abstr. Prop. Changes, Part 2, 1914, p. 42.

Editorial: Sarsaparilla does not commend itself to the Oxford Street savants, who desire to relegate it to the limbo of ex-official things.—Chem. & Drug. 1914, v. 84, p. 566.

Editorial: Sarsaparilla could be eliminated from the drug trade of the world without serious inconvenience, as far as the practice of therapeutics is concerned.—Meyer Bros. Drug. 1914, v. 35, p. 130.

Gehe & Co.: Both Honduras and Vera Cruz sarsaparilla have been exceptionally scarce.—Handelsbericht, 1914, p. 111.

Power and Salway: Chemical examination of sarsaparilla root.—J. Chem. Soc. Lond. 1914, v. 105, p. 201–219.

Rippetoe, J. R.: Two samples of sarsaparilla were found to contain 17.90 and 15.75 per cent of alcohol (32 per cent) extract and 12.60 and 13.99 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 442.

J. D. Riedel, A. G.: Sarsaparilla contained from 3.6 to 6.9 per cent of ash and from 19.3 to 28.1 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 33.

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Tunmann, O.: Some remarks on the occurrence of crystals in the sarsaparillas and some observations on Vera Cruz sarsaparilla.—Pharm. Zentralh. 1914, v. 55, p. 143–146.

E'we and Vanderkleed: Precipitation of glucoside from fluid extract of sarsaparilla, U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 275.

U. S. P. IX: Fluid extract of sarsaparilla to be made from No. 20 powder and diluted alcohol to be used as a menstruum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

U. S. P. IX: Compound fluid extract of sarsaparilla to be made from the drug in No. 20 powder. The first menstruum to consist of a mixture of glycerin 100 cc., alcohol 500 cc., and water 400 cc.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes. Part 3, 1914, p. 20.

Xrayser II: Sarsaparilla, though it has been official in this country for nearly three centuries, has always been regarded by some practitioners as of little or no value.—Chem. & Drug. 1914, v. 85, p. 517.

Turner, T. E.: The value of sarsaparilla is doubtful to therapeutists, possibly because empiric, but it must be of some use or the employment would not be so universal, both in and out of pharmacy.—Chem. & Drug. Australas. 1914, v. 24, p. 429.

Alsberg and Smith: Studies upon the long-continued feeding of saponin.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 517.

SASSAFRAS.

U. S. P. IX: The drug may include not more than 2 per cent of adhering wood. Ash not exceeding 30 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 401, and Abstr. Prop. Changes, Part 2, 1914, p. 43.

Rippetoe, J. R.: Six samples of sassafras were found to contain from 13.06 to 33.75 per cent of alcohol (70 per cent) extract and from 12.92 to 40.57 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 412.

J. D. Riedel, A.-G.: Sassafras contained from 0.9 to 2.1 per cent of ash and from 6.8 to 10.7 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Maines, E. L.: Sassafras bark was found to contain 11.93 and 43.93 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Turner, T. E.: Sassafras is omitted from the Ph. Brit. V. This is a mistake, as we want all the aromatics possible.—Chem. & Drug. Australas. 1914, v. 24, p. 429.

SCAMMONIUM.

U. S. P. IX: The dried root of *Convolvulus scammonia* yielding when assayed by the official process not less than 8 per cent of total

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resins of scammony root.—J. Am. Pharm. Assoc. 1914, v. 3, p. 402, and Abstr. Prop. Changes, Part 2, 1914, p. 44.

J. D. Riedel, A.-G.: Scammony root contained from 1.4 to 4 per cent of ash and from 22.2 to 26 per cent of extract soluble in water and from 32 to 39.3 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

Mann, E. W.: Curious results were obtained not only for two samples of "Aleppo" scammony, but also for two of so-called "Virg." We are glad to note that this unsatisfactory drug no longer receives official recognition.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 22.

Jensen, H. R.: Four samples of "Virgin" gum were found to contain 72, 74, 74.5, and 85 per cent of resin.—Evans' An. Notes, 1914, p. 60.

SCILLA.

U. S. P. IX: The fleshy, inner scales of the bulb of the white variety cut into pieces and carefully dried. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 402, and Abstr. Prop. Changes, Part 2, 1914, p. 44.

Editorial: Squill thrives exceedingly well in California. It is easily cultivated.—Pacific Pharm. 1914, v. 7, p. 297.

Rippetoe, J. R.: One sample of squill was found to contain 79.05 per cent of water extract and 2.40 per cent of ash. Acetic acid extract, 70.25 per cent.—Am. J. Pharm. 1914, v. 86, p. 443.

Maines, E. L.: Squill was found to contain from 2.29 to 6.98 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

J. D. Riedel, A.-G.: Squill contained from 1.8 to 4.2 per cent of ash, from 81 to 84.5 per cent extract soluble in water, and from 70.2 to 79.7 per cent extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 31.

Mann, E. W.: Three samples of the dry powder of squill yielded 3, 4.44, and 2.99 per cent, respectively, of ash (Ph. Brit. maximum 5 per cent).—Ann. Rep. Southall Bros. & Barclay, 1914, p. 23.

Kopaczewski, W.: Researches on the composition of squill. The toxic principle scillitin, a glucoside.—Compt. rend. Acad. sc. 1914, v. 158, p. 1520–1522.

U. S. IX: The fluid extract of squill to be made by extracting the drug with a mixture of alcohol 2 and water 1.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1570, and Abstr. Prop. Changes, Part 6, 1914, p. 8.

Hamilton, H. C.: A mistake was certainly made in adopting for the preparation of fluid extract of squill, U. S. P. VIII, a menstruum composed of a 10 per cent solution of acetic acid.—Am. J. Pharm. 1914, v. 86, p. 56–61.

U. S. P. IX: The tincture of squill to be prepared by percolation.—J. Am. Pharm. Assoc. 1914, v. 3, p. 547, and Abstr. Prop. Changes, Part 3, 1914, p. 24.

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Kopaczewski, W.: Observations on physiological action of scillitin and scillidiuretin.—Biochem. Ztschr. 1914, v. 66, p. 501–508. See also abstract: Therap. Monatsh. 1914, v. 28, p. 760.

Danysz and Kopaczewski: On the toxic properties of the active principle of squill, with report of animal experiments with rats, guinea pigs, rabbits, cats, and dogs.—Compt. rend. Soc. biol. 1914, v. 77, p. 59–61.

Editorial: Squill as a remedy is said to be especially valuable for old people who have chronic bronchitis and scanty urine.—Ellingwood's Therap. 1914, v. 8, p. 193.

SCOPARIUS.

Anon.: An illustrated description of *Cytisus scoparius*.—Chem. & Drug. 1914, v. 85, p. 34.

Rippetoe, J. R.: One sample of scoparius was found to contain 24.10 per cent of alcohol (49 per cent) extract and 2.95 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 442.

SCOPOLAMINÆ HYDROBROMIDUM.

U. S. P. IX: Hyoscine hydrobromide added as a synonym. Description modified. Test for foreign alkaloids, apoatropine, carbonizable impurities, and morphine added. The platinic chloride test is omitted.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1574, and Abstr. Prop. Changes, Part 6, 1914, p. 12.

Du Mez, A. G.: On the origin and usage of the terms "hyoscine" and "scopolamine." A criticism of the U. S. P.—Am. J. Pharm. 1914, v. 86, p. 339–349.

Straub, W.: Process for preparing stable scopolamine solutions. German Patent 266,415, May 29, 1913. Scopolamine solutions may be rendered stable by addition of a high molecular polyhydric alcohol.—J. Soc. Chem. Ind. 1914, v. 33, p. 42, and Schweiz. Apoth.-Ztg. 1914, v. 52, p. 340. See also Beck: Münch. med. Wchnschr. 1914, v. 61, p. 129–130, and Langer, H.: Pharm. J. 1914, v. 93, p. 147.

Sudler, Mervin Tubman: Case of poisoning by scopolamine (hyoscine) hypobromate.—J. Am. M. Assoc. 1914, v. 62, p. 1963.

Abré, Albert: A study of the curarelike action of scopolamine.—J. physiol. et pathol. gén. 1914, v. 16, p. 655–670.

Editorial: The dangers of twilight anesthesia.—New York M. J. 1914, v. 100, p. 284–285.

Rongy and Arluck: The use of scopolamine-morphine in labor. A preliminary report based upon a study of 100 cases, with a detailed report of every tenth case.—New York M. J. 1914, v. 100, p. 619–621. See also Editorial, p. 629–630, and Merck's Arch. 1914, v. 16, p. 308–311.

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Heller, Jacob: A study of 150 cases of twilight sleep.—Med. Rec. 1914, v. 86, p. 797–799.

Editorial: Unbiased opinion seems to be that the routine use of scopolamine-morphine injection in general medical work would increase the dangers to both the mother and child.—Hahnemann. Month. 1914, v. 49, p. 946–947.

SENEGA.

U. S. P. IX: The roots may include not more than 5 per cent of stems and other foreign matter. Description elaborated. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 403, and Abstr. Prop. Changes, Part 2, 1914, p. 45.

Gehe & Co.: Senega root continues to be scarce.—Handelsbericht, 1914, p. 112.

Rippetoe, J. R.: Five samples of senega were found to contain from 30.56 to 37.96 per cent of alcohol (63 per cent) extract and from 3.98 to 6.74 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 442.

Maines, E. L.: Senega root was found to contain from 5.04 to 6.97 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

J. D. Riedel, A.-G.: Senega contained from 2.6 to 5.7 per cent of ash and from 37.2 to 43 per cent of extract soluble in water and from 35 to 40.8 per cent of extract soluble in a mixture of 2 parts of alcohol and 3 parts of water.—Riedel's Berichte, 1914, p. 33.

U. S. P. IX: Fluid extract to be made from No. 30 powder and a mixture of alcohol 2 volumes and water 1 volume to be used as a menstruum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

SENNA.

U. S. P. IX: The drug may include not more than 10 per cent of stem tissues, pods, seeds, and other impurities. Alexandria senna and India senna described separately. Ash not exceeding 12 per cent. Ash insoluble in hydrochloric acid not exceeding 3 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 404, and Abstr. Prop. Changes, Part 2, 1914, p. 46.

Lefeldt, M.: The Ph. Germ. V should require that senna leaves have a characteristic odor and a sweetish subsequently bitter and irritating taste.—Pharm. Ztg. 1914, v. 49, p. 42.

Gehe & Co.: The market for senna is gradually changing, and America now imports much of this drug direct from the eastern countries.—Handelsbericht, 1914, p. 76.

Garrels, Arthur: The senna exported from Egypt is gathered from shrubs growing wild in the Anglo-Egyptian Sudan and the Red Sea districts of Arabia.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 61. See also J. Am. M. Assoc. 1914, v. 63, p. 1007.

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Baker, Henry D.: The Tinnevelly senna (*Cassia angustifolia*) of Indian commerce, which was introduced to both Indian and European pharmacy from Arabia, is extensively produced in the extreme south of the Indian Peninsula, near the towns of Tinnevelly, Madura, and Trichinopoly.—Oil, Paint & Drug Rep. 1914, v. 85, February 16, p. 38.

Editorial: There is a large and constant demand for senna, and this important article is very generally of inferior grade or highly adulterated.—Pacific Pharm. 1914, v. 7, p. 297.

Kebler, L. F.: Senna siftings as formerly sent to this country contained almost anything one might want to mention. At the present time the ash is not allowed to exceed 14 per cent, and this may be reduced still further in time.—Proc. Kentucky Pharm. Assoc. 1914, p. 129.

Rippetoe, J. R.: Five samples of Alexandria senna were found to contain from 12.60 to 31.72 per cent of alcohol (49 per cent) extract, 27.39 to 31.10 per cent of water extract, and 9 to 20.40 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 442–443.

Maines, E. L.: Senna was found to contain from 9.06 to 12.62 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Mann, E. W.: Ash yield for several specimens of the powdered senna ranged from 8.43 to 9.43 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 22.

Linke, H.: Seven samples of senna gave from 8.75 to 14.20 per cent of ash. Four of the samples exceeded the maximum of 12 per cent of the Ph. Germ. V.—Apoth.-Ztg. 1914, v. 29, p. 540.

Caesar & Loretz: Four samples of Tinnevelly senna contained from 10.3 to 15.82 per cent of ash.—Jahres-Ber. 1914, p. 38.

J. D. Riedel, A.-G.: Tinnevelly senna contained from 8.9 to 11.7 per cent of ash and from 39.8 to 48.5 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

Warren, L. E.: The detection of emodin-bearing drugs in presence of phenolphthalein.—Am. J. Pharm. 1914, v. 86, p. 444–449, and Rep. Chem. Lab. Am. M. Assoc. 1914, v. 7, p. 19–24.

Bailey, E. Monroe: Some reactions of chrysophanic acid with reference to its detection in complex medicinal preparations.—J. Ind. & Eng. Chem. 1914, v. 6, p. 320–321.

U. S. P. IX: For fluid extract of senna directs the use of a mixture of alcohol 1 volume and water 2 volumes as a menstruum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

Anon.: A formula for an improved aromatic syrup of senna is reprinted.—N. A. R. D. Notes, 1914, v. 18, p. 1171.

Anon.: For completely removing the resin from senna leaves, a sufficient amount of strong alcohol must be used.—Ztschr. Allgem.

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österr. Apoth.-Ver. 1914, v. 52, p. 155. See also Ruediger: Drug. Circ. 1914, v. 58, p. 527.

Lindbom, Oskar: The intramuscular injection of sennatin.—Therap. Monatsh. 1914, v. 28, p. 509. See also Betke, R.: p. 688–692.

SERPENTARIA.

U. S. P. IX: The drug may include not more than 10 per cent of the stems. Description elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 404, and Abstr. Prop. Changes, Part 2, 1914, p. 46.

Webb, Frank: The internal and hypodermic use of serpentaria; a stimulant to the skin-increasing secretions.—Eclectic M. J. 1914, v. 74, p. 569–570.

SERUM ANTIDIPHTHERICUM.

U. S. P. IX: To describe serum antidiphthericum, serum antidiphthericum purificatum, and serum antidiphthericum siccum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1101–1102, and Abstr. Prop. Changes, Part 5, 1914, p. 2–3.

Heubner, O.: The practical introduction of Behring's antidiphtheric serum. A review.—Berl. klin. Wchnschr. 1914, v. 51, p. 484–485.

Stewart, J. Reverdy: Brief outline of the method employed in the production of antidiphtheritic globulins.—J. Am. Pharm. Assoc. 1914, v. 3, p. 859.

Porter, Joseph Y.: Presentation of data relating to the cost and use of antitoxins in Florida.—Rep. Florida Bd. Health, 1914, p. 135–139.

Kinyoun, J. J.: A careful estimate made of the cost per thousand units of diphtheria antitoxin, just after the precipitating method was introduced, showed that it ran from 6½ to 8¼ cents.—J. Am. M. Assoc. 1914, v. 63, p. 862, and Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 184.

Anon.: The immunity unit for diphtheria antitoxin is fixed by law, and there is every reason to believe that all the diphtheria antitoxin furnished by licensed manufacturers conforms in strength to the requirements established by the United States Government.—J. Am. M. Assoc. 1914, v. 63, p. 263.

Tuder, Thomas J., and others: The treatment of diphtheria. Reply to prize question No. 144.—New York M. J. 1914, v. 99, p. 885–888, 937–938.

Woody, Samuel S.: Diphtheria antitoxin as generally used is given in doses far too small.—J. Am. M. Assoc. 1914, v. 63, p. 861–862, and Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 178–183.

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Anderson, John F.: Ten thousand units of diphtheria antitoxin is of more value when given early than 100,000 or 200,000 when given later.—J. Am. M. Assoc. 1914, v. 63, p. 862. See also Editorial, p. 873, and p. 2134–2135.

Jervais and Martyn: It is believed by many medical men that liberal doses of antitoxin are responsible for many of the bad after-effects or sequelæ of diphtheria, such as paralysis and neuritis.—Practitioner, 1914, v. 93, p. 284.

Park, Famulener, and Banzhaf: Serum sensitization as related to dosage of antitoxin, in man and animals.—J. Infect. Dis. 1914, v. 14, p. 347–350.

Goodale, J. L. L.: Anaphylactic reactions occurring in horse asthma after the administration of diphtheria antitoxin; with report of eight cases.—Boston M. & S. J. 1914, v. 170, p. 837–838.

Editorial: Warning against the indiscriminate use of antitoxin.—Am. Med. 1914, v. 20, p. 130.

Ruppel, W. G.: On the changes in the specific treatment of diphtheria.—Deutsch. med. Wchnschr. 1914, v. 40, p. 547–548.

Blackburn, W. J.: Diphtheria antitoxin is the most overrated remedy used to-day, but one is almost compelled to use it.—Hahnemann Month. 1914, v. 49, p. 428.

Polak, Otto: The treatment of erysipelas with diphtheria antitoxin.—Münch. med. Wchnschr. 1914, v. 61, p. 2273–2274.

Bauer, J.: On the prophylaxis of diphtheria according to v. Behring.—Deutsch. med. Wchnschr. 1914, v. 40, p. 582–583.

Otto, R.: On the diphtheria antitoxin present in the blood of healthy adults, convalescents, and bacillus carriers, with observations on the significance of the latter in diphtheria.—Deutsch. med. Wchnschr. 1914, v. 40, p. 542–545.

Park, Zingher, and Serota: Active immunization in diphtheria and treatment by toxin-antitoxin. Active immunization produced a very decided increase of antitoxin in a relatively short time in all persons who had natural antitoxin. These, however, were immune to diphtheria before the injections were made.—Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 171–177.

Wilson, Robert J.: The Schick test for determining the presence of diphtheria antitoxin normally in the body is important with regard to the spread of diphtheria. If no reaction follows, it means that there was one or two or three units of antitoxin in the body.—J. Am. M. Assoc. 1914, v. 63, p. 1945.

Schreiber, E.: The present status of diphtheria immunization according to v. Behring.—Therap. Gegenw. 1914, v. 55, p. 97–101.

For additional references see J. Am. M. Assoc.; Index. Med.; Ztschr. Immun. u. exper. Therap.; and Berl. klin. Wchnschr.

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SERUM ANTITETANICUM.

U. S. P. IX: Serum antitetanicum described as a fluid separated from the coagulated blood of a horse, *Equus caballus* Linné, highly actively immunized against tetanus toxin; also as serum antitetanicum purificatum and serum antitetanicum siccum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1102–1103, and Abstr. Prop. Changes, Part 5, 1914, p. 3–4.

Editorial: The standardization of tetanus antitoxin. Comments on the favorable report on the American method of standardization.—Brit. M. J. 1914, v. 1, p. 733.

Francis, Edward: Laboratory studies on tetanus.—Bull. Hyg. Lab. No. 95, pp. 73.

Irons, Ernest E.: Statistical studies of reports of 225 cases of tetanus treated with antitoxin serum.—J. Am. M. Assoc. 1914, v. 62, p. 2025–2027.

Park and Nicoll: While tetanus antitoxin has proved most efficacious in the prevention of tetanus, its employment as a curative agent has been much less successful.—J. Am. M. Assoc. 1914, v. 63, p. 235–240.

Meyer, Karl A., and others: The treatment of tetanus. Answers to prize question No. 147.—New York M. J. 1914, v. 100, p. 230–233, 279–282.

MacConkey, Alfred: Tetanus, its prevention and treatment by means of antitetanic serum.—Brit. M. J. 1914, v. 2, p. 609–614.

Sheaf, Eric W.: The treatment of tetanus.—Lancet, 1914, v. 187, p. 1017–1018.

Mühsam, Hans: Contribution on the treatment of tetanus. Report of cases.—Berl. klin. Wchnschr. 1914, v. 51, p. 1784–1786. See also Wolfsohn, p. 1883–1884.

Müller, Eduard: Suggestions on the treatment of tetanus and the need for recognizing early symptoms.—Münch. med. Wchnschr. 1914, v. 61, p. 2257–2259. See also Rothfuchs, p. 2259–2260; Alexander, p. 2260–2261; Kreuter, p. 2255; Siemon, p. 2322–2323; Usener, Walther, p. 2323; Jacobstahl and Tamm, p. 2324; Teller, p. 2325.

Czerny, V.: The therapy of tetanus.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1905–1909, 1933–1935. See also Falk, p. 1909–1911; Kocher, Theodor, p. 1953–1956, 1981–1983; v. Behring, p. 1956; Lewandowsky, p. 2060.

Boenheim, Felix: A case of intoxication following the use of tetanus antitoxin.—Berl. klin. Wchnschr. 1914, v. 51, p. 1956–1957.

Simon, Ludwig: The danger of anaphylaxis in the serum treatment of tetanus.—Münch. med. Wchnschr. 1914, v. 61, p. 2223–2225.

Brem, Walter V.: The development of suppurative serum meningitis following the intraspinal injection of tetanus antitoxin.—J. Am. M. Assoc. 1914, v. 62, p. 191–193.

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For additional references on antitetanic serum see J. Am. M. Assoc., J. Infect. Dis., Brit. M. J., Lancet, Compt. rend. Soc. biol., Münch. med. Wchnschr., and Therap. Monatsh.

SEVUM PRÆPARATUM.

U. S. P. IX: Tests for limit of free acid added. Saponification value, not less than 193 nor more than 200. Iodine value, not less than 33 nor more than 48.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1575, and Abstr. Prop. Changes, Part 6, 1914, p. 13.

SINAPIS.

U. S. P. IX: Mustard, white or black, may include not more than 5 per cent of other harmless seeds and other foreign matter. Starch not exceeding 2.5 per cent. Ash not exceeding 9 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 405, and Abstr. Prop. Changes, Part 2, 1914, p. 47.

Anon.: Mustard, figs, hops, and prunes are commercial products needing no pharmacopœial definition.—Lancet, 1914, v. 187, p. 907.

Henkel, Alice: An illustrated description of *Brassica nigra* L.—Phys. Drug. News, 1914, v. 9, p. 123, and of *Sinapsis alba* L.—p. 124. See also Spatula, 1914, v. 20, p. 351, 352, and Chem. & Drug. 1914, v. 84, p. 740, 821.

Alsberg, Carl L.: The proper conditions for detecting charlock, a common weed seed in ground mustard and prepared mustard, by chloral hydrate solution have been determined.—Am. Food J. 1914, v. 9, p. 21.

Wester, D. H.: A review of the method for the valuation of *Brassica nigra*.—Pharm. Weekblad, 1914, v. 51, p. 205–207.

Caesar & Loretz: The valuation of mustard, with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 107–108.

Linke, H.: The volatile oil content of two samples was found to vary from 0.7 to 0.55 per cent.—Apoth.-Ztg. 1914, v. 29, p. 663.

Wester, D. H.: Observations on the oil content of black mustard seed.—Ber. deutsch. pharm. Gesellsch. 1914, v. 24, p. 123–125.

Schneider and Wrede: The examination of mustard glucosides. V. The constitution of sinigrin.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2225–2229.

Rippetoe, J. R.: Four samples of black mustard were found to contain from 4.70 to 5.28 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 440.

Caesar & Loretz: Fifteen samples of black mustard were found to contain from 0.595 to 1.13 per cent of volatile oil.—Jahres-Ber. 1914, p. 40.

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J. D. Riedel, A.-G.: Mustard seeds contained from 5.2 to 5.9 per cent of ash and from 22.8 to 27.3 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 33.

SODII ACETAS.

Anon.: Sodium acetate is the principal ingredient in the hot-water tins used on railways.—Chem. & Drug. Australas. 1914, v. 29, p. 243.

SODII ARSENAS.

U. S. P. IX: Rubric for solution of sodium arsenate to read not less than 0.975, nor more than 1.025 per cent of anhydrous sodium arsenate. Method of assay modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 532, and Abstr. Prop. Changes, Part 3, 1914, p. 9.

Becker, I. A.: The rubric for solution of sodium arsenate states "not less than 0.975 per cent, nor more than 1.025 per cent," but the assay requires "not less than 0.95 per cent, nor more than 1 per cent," a discrepancy that ought to be corrected.—Nat Druggist, 1914, v. 44, p. 419.

SODIUM ARSANILATE.

Rupp, E.: Modified method for the quantitative determination of arsenic in sodium acetylarsanilate is outlined.—Südd. Apoth.-Ztg. 1914, v. 54, p. 314, and Apoth.-Ztg. 1914, v. 29, p. 724.

Kollo, Konstantin: Solutions of sodium arsanilate for ampoules should be prepared in a sterile apparatus.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

SODII BENZOAS.

Hill, C. A.: Of 27 samples of sodium benzoate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 6 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 23.

Lewis, Howard B.: The synthesis and rate of elimination of hippuric acid after benzoate ingestion in man.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 175–176.

Barnard, H. E.: The benzoate of soda controversy. A report of the decision in the District Court of the United States for the District of Indiana to the effect that the State food and drugs act does not violate any of the provisions of the constitution of Indiana.—Rep. Indiana Bd. Health. 1914, p. 519–527. See also Editorial: Med. Rec. 1914, v. 86, p. 514, and Am. Food. J. 1914, v. 9, p. 287.

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SODII BICARBONAS.

Fedotieff and Koltunoff: A new form of the ammonia soda process.—Ztschr. anorg. Chem. 1914, v. 85, p. 247–260.

Hill, C. A.: Of 69 samples of sodium bicarbonate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 4 parts per million. The arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 23.

E'we, G. E.: One sample of sodium bicarbonate, reagent, examined contained traces of broken amber glass. This occurrence again emphasizes the need for pharmacists to watch their bottles carefully for slivers and glass blisters that may be the cause of such occurrences.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 157.

Kebler, L. F.: Outline of method for the determination of sodium bicarbonate in compound tablets containing acetanilid.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1081.

Anon.: Sodium bicarbonate as an antidote for corrosive sublimate.—J. Am. M. Assoc. 1914, v. 62, p. 795. See also p. 796.

Brand, B.: In the treatment of gout a paste of sodium bicarbonate and water is applied to the inflamed joints and kept continuously moist is said to give surprisingly good results.—Critic and Guide, 1914, v. 17, p. 118.

Czapski, Ludwig: Additional reports on experimental observations on alkali therapy.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 226–240.

Hertz and Goldberg: The influence of sodium bicarbonate on the elimination of chlorides and of lactose injected in the veins.—Compt. rend. Soc. biol. 1914, v. 76, p. 234–235.

Ladd, Maynard: The influence of alkalies upon gastric motility.—Boston M. & S. J. 1914, v. 170, p. 815–821.

Wilbrand, Eberhard: Observations on the action of sodium bicarbonate on the pancreas secretion. —Münch. med. Wchnschr. 1914, v. 61, p. 1437–1439.

SODII BORAS.

Fernau, Albert: At 15° sodium borate is soluble in 25 parts of water.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 263.

Linke, H.: Commerical borax does not always comply with the Ph. Germ. V. requirements with respect to sodium borate.—Apoth.-Ztg. 1914, v. 29, p. 674.

Hill, C. A.: Of 692 samples of borax examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 60 parts per million. The arsenic content varied from 0.4 to 100 parts per million.—Chem. & Drug. 1914, v. 85, p. 21.

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Mann, E. W.: Practically all the samples of borax examined were within the 5 parts per million of arsenic fixed as maximum for the salt now officially described as Borax Purificatus.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 44.

Jensen, H. R.: Ninety-one samples of borax of the better grade, with but one exception, contained 5 parts arsenic per million, or less. Eleven samples of the commercial article averaged 35 parts arsenic per million.—Evans' An. Notes, 1914, p. 15.

Bouyer, J.: The incompatibility of sodium borate and cocaine hydrochloride. An illustrated description of the crystals observed.—Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 64–69.

Harris, H. L.: A contribution on the use of food preservatives. Borax and boric acid are permitted in England and Australia, but not in the United States.—Am. Med. 1914, v. 20, p. 68.

Anon.: The use of borax as a fly preventive.—Am. Food. J. 1914, v. 9, p. 614.

SODII BROMIDUM.

Cook, C. W.: The crystal form of sodium bromide.—Am. J. Sci. 1914, v. 188, p. 143.

Jensen, H. R.: Twenty-seven samples of sodium bromide contained 99 to 100 per cent (average 99.5), this variation being almost entirely due to its hygroscopic character.—Evans' An. Notes, 1914, p. 64.

Hill, C. A.: Of four samples of sodium bromide examined during the years 1910, 1911, and 1913, the chloride content calculated as sodium chloride varied from 0 to 1.25 per cent.—Chem. & Drug. 1914, v. 85, p. 19.

Finnemore, Horace: The incompatibility of sodium nitrite and ammonium bromide is due to the formation of ammonium nitrite by double decomposition. This product decomposes into water and nitrogen, the latter being responsible for the occasional bursting of the container.—Brit. M. J. 1914, v. 1, p. 790–791.

Braun, Israel: Bromides are useful as antispasmodics in the treatment of bronchial asthma, but inferior to other remedies, as the patient soon gains a tolerance or brominism.—Merck's Arch. 1914, v. 16, p. 107.

Anon.: The treatment of delirium tremens by the subdural injection of sodium bromide. A review of an article by Kraemer.—Therap. Gaz. 1914, v. 38, p. 262–263.

SODIUM CACODYLATE.

Kollo, Konstantin: Ampoules of sodium cacodylate may be sterilized in steam for 15 minutes at 110°.—Südd. Apoth.-Ztg. 1914, v. 54, p. 70.

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Ackermann, S. H.: Hypodermic injections of sodium cacodylate in the treatment of ulcers of doubtful origin.—Merck's Arch. 1914, v. 16, p. 103–104.

Anon.: While sodium cacodylate has not been used to a sufficient extent to determine its value in the treatment of syphilis, the available evidence seems to be that it is of service but not an agent to be relied on alone. Its action, while not so rapid, is not unlike that of salvarsan.—J. Am. M. Assoc. 1914, v. 62, p. 476. See also v. 63, p. 1223.

SODII CARBONAS MONOHYDRATUS.

Clark, A. H.: Report on 12 samples of sodium carbonate, which were found to vary from 73.28 to 99.48 per cent of anhydrous sodium carbonate. Sodium carbonate sold as monohydrate is not always what it is claimed to be.—Drug. Circ. 1914, v. 59, p. 456–457.

E'we, G. E.: One lot of sodium carbonate, monohydrated, examined was contaminated with an unidentified substance which caused the sodium carbonate to give pink solutions.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 157.

Hill, C. A.: Of 138 samples of sodium carbonate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 30 parts per million. The arsenic content varied from 0 to 0.8 parts per million.—Chem. & Drug. 1914, v. 85, p. 23.

Bohrisch, P.: The Ph. Germ. V requirements for dry sodium carbonate are not satisfactory and do not respond with the commercially available product.—Apoth.-Ztg. 1914, v. 29, p. 902, and Pharm. Zentralh. 1914, v. 55, p. 908.

Fedotieff and Koltunoff: A new form of the ammonia soda process.—Ztschr. anorg Chem. 1914, v. 85, p. 247–260.

Spazier, M.: Process for producing sodium carbonate crystals. English patent 29827, December 27, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 749.

Richards and Fiske: On the transition temperatures of the hydrates of sodium carbonate as fixed points in thermometry.—J. Am. Chem. Soc. 1914, v. 36, p. 485–490, and Chem. News, 1914, v. 110, p. 76–78.

SODII CHLORIDUM.

Wilbert, M. I.: In English-speaking countries, the continental "chloratum" for the chlorides, has not infrequently been mistaken for chlorate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 652.

Patents for the manufacture of common salt.—J. Soc. Chem. Ind. 1914, v. 33, p. 255, 256, 353, 961.

Chelle, L.: The presence of bromides in table salt.—Bull. Pharm. Soc. Bordeaux, 1914, v. 54, p. 19–24.

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Alsberg, Carl L.: An investigation of the impurities in table, dairy, and other grades of salt manufactured from the Ohio River Valley brines has been completed. Special search was made to detect in these brines the presence of poisonous barium chloride.—Am. Food J. 1914, v. 9, p. 22.

Hill, C. A.: Of 121 samples of sodium chloride examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 26 parts per million. The arsenic content varied from 0 to 0.4 parts per million.—Chem. & Drug. 1914, v. 85, p. 23.

English and Turner: The action of steam on sodium chloride.—Proc. Chem. Soc. 1914, v. 30, p. 162.

Siboni, G.: The preparation of isotonic solutions.—Boll. chim.-farm. 1914, v. 53, p. 729–731.

U. S. P. IX: To require for "saline solution" 8.5 gm. sodium chloride in distilled water sufficient to make 1,000 cc. To be sterilized under pressure for 15 minutes or by boiling for at least 1 hour. Solutions should be freshly prepared.—J. Am. Pharm. Assoc. 1914, v. 3, p. 532, and Abstr. Prop. Changes, 1914, Part 3, p. 9.

Becker, I. A.: The use of 8.5 gm. of sodium chloride per liter seems a rather large amount.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1024, and Nat. Druggist, 1914, v. 44, p. 419.

Taege, Karl: A rapid method for the production of sterile salt solution.—(Münch. med. Wchnschr. 1914, p. 1325) Pharm. Zentralh. 1914, v. 55, p. 714; also J. Am. M. Assoc. 1914, v. 63, p. 284.

Pilcher and Sollmann: Effects of intravenous infusion of normal saline.—J. Am. M. Assoc. 1914, v. 63, p. 888.

Guthrie and Lee: The sensory effect of local application of hypertonic salt solutions.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 146–148. See also p. 149.

Geyser, A. C.: The use and abuse of normal salt solution.—Am. Med. 1914, v. 20, p. 57–61.

Litchfield, Lawrence: The administration of any artificial serum as routine postoperative practice is questionable therapeutics.—J. Am. M. Assoc. 1914, v. 63, p. 307–310. See also Wooley, Paul G., p. 596–597, and Editorial, p. 583.

Abel, Rowntree, and Turner: The removal of diffusible substances from the circulating blood of living animals by dialysis.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 275–316, and p. 611–623.

MacCallum and Lambert: Modifications of the Abel vividiffusion apparatus.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 78–80.

Lowenburg, H.: Efficiency of sodium chloride in the therapeutics of Bright's disease.—J. Am. M. Assoc. 1914, v. 63, p. 1906–1909. See also Herbert, Paul Z., p. 2305–2306.

Dyer, Isadore: The use of sodium chloride in the treatment of pellagra.—Merck's Arch. 1914, v. 16, p. 255.

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For additional references on sodium chloride see J. Am. M. Assoc.; Index Med.; Chem. Abstr.; Chem. Zentralbl.; J. Chem. Soc. Lond.

SODII CITRAS.

Rudnick, Derby, and Latshaw: A comparison of neutral ammonium citrate with sodium citrate and N/10 citric acid.—J. Ind. & Eng. Chem. 1914, v. 6, p. 486–487.

Bosworth, Alfred W.: The use of sodium citrate for the determination of reverted phosphoric acid.—J. Ind. & Eng. Chem. 1914, v. 6, p. 227–228.

van Slyke, L. L.: Sodium citrate prevents curdling of milk by increasing the amount of soluble calcium in the milk.—Drug Topics, 1914, v. 29, p. 135. See also J. Am. M. Assoc. 1914, v. 62, p. 1283.

Ladd, Maynard: The influence of alkalies (sodium citrate) upon gastric motility.—Boston M. & S. J. 1914, v. 170, p. 518–521.

Greenwald, Isidor: The administration of sodium citrate to phlorhizinized dogs and to a patient with diabetes mellitus was followed by an increased excretion of glucose, indicating the conversion of the six carbon atoms of citric acid into glucose.—J. Biol. Chem. 1914, v. 18, p. 115–121.

SODIUM CYANIDE.

Gravier, Charles: The industrial synthesis of sodium cyanide.—Sci. Am. Suppl. 1914, v. 77, p. 134–135.

SODIUM FORMATE.

Beringer, George M.: A proposed monograph for sodium formate. It should contain when dried not less than 98 per cent of anhydrous sodium formate.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1600.

SODII HYDROXIDUM.

Schutz, E.: Manufacture of caustic alkalies from alkali carbonates. German Patent 272,790, April 19, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 692.

E'we, G. E.: One sample of electrolytic sodium hydroxide was distinctly blue in color, but gave colorless solution.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 157.

Stockinger and Vanderkleed: One sample of sodium hydroxide reagent examined contained 0.864 per cent of sodium chloride.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 157.

Jackson and Bolton: On the action of sodium hydroxide on iodoanil.—J. Am. Chem. Soc. 1914, v. 36, p. 551–568.

U. S. P. IX: Rubric for solution of sodium hydroxide to read not less than 4.5 per cent of sodium hydroxide. Tests for limit of carbo-

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nate and modified method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 532, and Abstr. Prop. Changes, Part 3, 1914, p. 9.

SODII HYPOPHOSPHIS.

E'we, G. E.: One lot of sodium hypophosphite examined tested only 96.6 per cent instead of 98 per cent, required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 157.

Hill, C. A.: Of 22 samples of sodium hypophosphite examined during 1912 and 1913, the lead content varied from 2 to 18 parts per million. The arsenic content varied from 0 to 7.5 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

SODII IODIDUM.

Jensen, H. R.: Eight samples of sodium iodide were estimated to contain 99.2 to 99.6 per cent of pure salt (average 99.4 per cent).—Evans' An. Notes, 1914, p. 64.

E'we, G. E.: Of two lots examined, one tested only 92.9 per cent of NaI, instead of the 98 per cent required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 157.

Stüwe, E.: A direct iodometric method for the determination of soluble iodides.—Apoth.-Ztg. 1914, v. 29, p. 382.

Wightman, Davis, Holmes, and Jones: Conductivity and viscosity of solutions of potassium iodide and of sodium iodide in mixtures of ethyl alcohol and water.—J. chim. phys. 1914, v. 12, p. 385–394.

Macht, D. I.: The action of potassium and sodium iodides and of the iodine ion on the heart and blood vessels.—J. H. Hosp. Bull. 1914, v. 25, p. 278–284, and J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 514.

SODII NITRIS.

Mann, E. W.: Some difficulty has been experienced in obtaining sodium nitrite sufficiently free from lead, 35 and 44 parts per million being found in two instances.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 48.

Hill, C. A.: Of seven samples of sodium nitrite examined during 1911 and 1912 the lead content varied from 0 to 40 parts per million. The arsenic content varied from 0.2 to 0.4 part per million.—Chem. & Drug. 1914, v. 85, p. 23.

Rupp, E.: Outline of method of assay for sodium nitrite.—Apoth.-Ztg. 1914, v. 29, p. 724, and Südd. Apoth.-Ztg. 1914, v. 54, p. 322.

Harnack, Erich: Poisoning from the internal administration of nitrites.—Vrtljschr. ger. Med. 1914, v. 47, p. 257-264.

Macht, D. I.: Action of the nitrites on the isolated surviving pulmonary artery.—J. Am. M. Assoc. 1914, v. 62, p. 524. See also J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 23.

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SODII NITRAS.

Ross, William H.: The origin of nitrate deposits. A popular review.—Pop. Sci. Month. 1914, v. 85, p. 134–145.

Anon.: A description of the method employed in producing Chile saltpeter.—Südd. Apoth.-Ztg. 1914, v. 54, p. 53.

Editorial: A review of the economical conditions of the sodium nitrate market, with a table showing the quantities and monthly production for 1912–13.—Oil, Paint & Drug. Rep. 1914, v. 85, January 12, p. 9.

SODIUM PERBORATE.

Philipp, Herbert: A review of the chemistry of sodium perborate.—Pharm. Era, 1914, v. 47, p. 103.

Wagner, Hans: Perborates may be produced by combining borax or other sodium salt of boric acid with sodium peroxide.—Südd. Apoth.-Ztg. 1914, v. 54, p. 627.

SODII PHOSPHAS.

Jensen, H. R.: Two samples of acid sodium phosphate each contained 94.5 per cent of pure sodium phosphate.—Evans's An. Notes, 1914, p. 65.

Scoville, W. L.: Sodium phosphate should be watched carefully for excess of arsenic. Two lots were rejected for this reason.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1289.

Hill, C. A.: Of 347 samples of sodium phosphate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 8 parts per million. The arsenic content varied from 0 to 1.6 parts per million.—Chem. & Drug. 1914, v. 85, p. 23.

Umney and Bennett: Commercial standards for sodium phosphate.—Brit. & Col. Drug. 1914, v. 66, p. 71; also Pharm. J. 1914, v. 92, p. 135–136.

E'we, G. E.: Dried sodium phosphate varies greatly in moisture. Three lots contained 0.4, 2.6, and 12 per cent of moisture, respectively.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 158.

Umney and Bennett: Ten samples of dried sodium phosphate were found to contain from 0.5 to 31.3 per cent of moisture. Five per cent would be a reasonable limit.—Pharm. J. 1914, v. 93, p. 136, and Year-Book of Pharmacy, 1914, p. 409.

Thurston, Azor: Six samples of granular effervescent sodium phosphate on examination were found to contain from 2.70 to 21.98 per cent of anhydrous sodium phosphate in place of 20 per cent required by the Pharmacopœia.—Proc. Ohio Pharm. Asoc. 1914, p. 42, and Midl. Drug. 1914, v. 48, p. 362.

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Roller, Emil: A formula for an effervescent solution of citro-phosphate of soda as a substitute for citrate of magnesia.—Drug. Circ. 1914, v. 57, p. 684.

SODII SALICYLAS.

Linke, H.: In applying the test for chlorides in sodium salicylate care must be exercised to use a sufficient amount of nitric acid.—Apoth.-Ztg. 1914, v. 29, p. 694.

Bohrisch, P.: The Ph. Germ. V test for chloride in sodium salicylate should be changed.—Pharm. Zentralh. 1914, v. 55, p. 909, and Apoth.-Ztg. 1914, v. 29, p. 902.

Astre, Ch.: The analysis of official sodium salicylate. The residue from each gm. of the substance varied from 0.325 to 0.331 gm. of sodium carbonate.—Bull. pharm. sud-est, 1914, v. 19, p. 33–34.

Beckers, Wilhelm: A sample of powdered sodium salicylate, partially insoluble, was found to be contaminated with aluminum, calcium, and silicic acid, evidently from carelessness in the powdering.—Südd. Apoth.-Ztg. 1914, v. 54, p. 254–255.

E'we, G. E.: Of four lots of sodium salicylate examined, only one met the U. S. P. requirement of 99.5 per cent.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 158.

Jensen, H. R.: Twenty-eight samples of sodium salicylate were of 99.3 to 99.9 per cent purity, with free acid 0.03 to 0.13 per cent (average 0.07 per cent).—Evans's An. Notes, 1914, p. 65.

Strode, Sylvanus E.: Of three samples of sodium salicylate from oil of wintergreen examined, one was not passed.—Rep. Ohio D. & F. Div. 1914, p. 120.

Hill, C. A.: Of 41 samples of sodium salicylate examined during the years 1911 to 1913, inclusive, the lead content varied from 2 to 24 parts per million. The arsenic content varied from 0 to 2 parts per million.—Chem. & Drug. 1914, v. 85, p. 23.

Jones, H. W.: The assay of medicinal tablets containing salicylates.—Am. Druggist, 1914, v. 62, p. 369.

Howard, Charles D.: Of eight samples of sodium salicylate tablets, one was found deficient, containing 83 per cent of the claimed amount.—Bull. New Hampshire Bd. Health, 1914, v. 3, p. 56.

Brown, L. A.: Four samples of tablets of sodium salicylate analyzed; one passed, and three adulterated. Samples ranged in strength from 102.8 to 83.6 per cent of the declared strength.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Kebler, L. F.: Outline of method for the determination of sodium salicylate in compound tablets containing acetanilide.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1084.

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Kochmann, M.: The objectionable characteristics of salicylic acid and of the soluble salicylates include taste, gastric irritation, auditory disturbances, renal irritation, and excessive perspiration.—Therap. Monatsh. 1914, v. 28, p. 652.

Hanzlik, Paul J.: The salicylates; a historical and critical review of the literature.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 131–189.

Miller, Joseph L.: The specific action of salicylates in acute articular rheumatism.—J. Am. M. Assoc. 1914, v. 63, p. 1107–1109, and Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 213–223.

Coleman, Warren: Sodium salicylate with double the amount of sodium bicarbonate and rather large doses gave prompt relief.—J. Am. M. Assoc. 1914, v. 63, p. 1110.

Editorial: Calls attention to some recently observed misleading exploitations of sodium salicylate.—J. Am. M. Assoc. 1914, v. 62, p. 55.

Conner, Lewis A.: Intravenous injections of sodium salicylate in the treatment of rheumatic affections.—Med. Rec. 1914, v. 85, p. 323–325. See also Seibert, A., p. 397–398.

Heyn, Louis G.: Intrarectal administration of sodium salicylate in acute rheumatic fever with satisfactory results.—J. Am. M. Assoc. 1914, v. 63, p. 1004–1005, and Critic and Guide, 1914, v. 17, p. 432.

Isenschmid, R.: Experimental observations on the action of sodium salicylate on body temperature of animals without thermo-regulation.—Arch. exper. Path. u. Pharmakol. 1914, v. 75, p. 10–32.

SODII SULPHAS.

Anon.: An illustrated description of Glauber's works, from a copy of the collected works of John Rudolph Glauber, who was the first to procure hydrochloric acid by the action of oil of vitriol on common salt.—Meyer Bros. Drug. 1914, v. 35, p. 144–145.

Richter, Ernst: A sample of sodium sulphate was found to contain sulphite.—Apoth.-Ztg. 1914, v. 29, p. 686.

Hill, C. A.: Of 1,709 samples of sodium sulphate examined during the years 1910 to 1913, inclusive, the lead content varied from 0 to 26 parts per million. The arsenic content varied from 0 to 20 parts per million.—Chem. & Drug. 1914, v. 85, p. 23.

Umney and Bennett: Sodium sulphate readily parts with its water at 100° and, on a small scale, the salt is practically anhydrous at the end of two hours, the loss being 55.7 to 55.9 per cent.—Pharm. J. 1914, v. 93, p. 136, and Year-Book of Pharmacy, 1914, p. 409.

Jensen, H. R.: One sample of the exsiccated salt was rejected, owing to the presence of 8 parts of arsenic per million.—Evans' An. Notes, 1914, p. 65.

Richter, Ernst: A sample of dried sodium sulphate was found to contain chlorine.—Apoth.-Ztg. 1914, v. 29, p. 211.

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SODII SULPHIS.

Clark, A. H.: The recognition by the Pharmacopœia of crystalline sodium sulphite is a serious mistake. The Pharmacopœia should describe the anhydrous sodium sulphite.—Drug. Circ. 1914, v. 50, p. 367.

Anon.: With silver nitrate solution, pure sulphites give a snow-white precipitate which retains its color for a long time, even in daylight. In the presence of hyposulphite, the precipitate rapidly becomes colored, passing to black.—Merck's Rep. 1914, v. 23, p. 278.

Patch, E. L.: Reports that nine samples varied from 22 to 98.28 per cent of pure sodium sulphite.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1289.

Jensen, H. R.: The better qualities of sodium sulphite examined were found to contain 94 to 99.9 per cent of pure salt, whilst the purity of the commercial samples ranged from 90 to 97.6 per cent.—Evans' An. Notes, 1914, p. 65.

Hill, C. A.: Of 35 samples of sodium sulphite examined during the years 1910 to 1913, inclusive, the lead content varied from 1 to 12 parts per million. The arsenic content varied from 0 to 1.6 part per million.—Chem. & Drug. 1914, v. 85, p. 23.

Mann, E. W.: A specimen of sodium sulphite, exsiccated, proved to contain just 0.5 per cent of sodium sulphite, the remainder being mainly sulphate.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 49.

SODII THIOSULPHAS.

Bodnár, J.: A new and simple titrimetric method for the determination of thiosulphate; also in the presence of sulphate.—Ztschr. anal. Chem. 1914, v. 53, p. 37–41.

Vanino and Schinner: Observations on the action of various acids on sodium thiosulphate in the presence of formaldehyde.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 2562–2566.

Salkowski, E.: On the origin of thiosulphate occurring in the urine of rabbits.—Ztschr. physiol. Chem. 1914, v. 92, p. 89–103.

Burnett, J. A.: The purgative and antimalarial effect of sodium thiosulphate should be more generally known.—Phys. Drug News, 1914, v. 9, p. 116.

Dean, C. B.: I have depended on sodium hyposulphite to ward off smallpox not only among those who are unvaccinated, but those who have been successfully vaccinated.—Ellingwood's Therap. 1914, v. 8, p. 341.

SODIUM GLYCEROPHOSPHATE.

U. S. P. IX: Sodii glycerophosphas to contain not less than 66 per cent of anhydrous sodium glycerophosphate. It is very soluble in

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cold and hot water; nearly insoluble in alcohol. Tests for phosphates and limit of alcohol-soluble impurities added also method of assay.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1575, and Abstr. Prop. Changes, Part 6, 1914, p. 13.

Anon.: The second supplement to the Ph. Ndl. IV describes sodium glycerophosphate as occurring in white, odorless crystals.—Pharm. Post, 1914, v. 47, p. 125. See also: Pharm. Weekblad, 1914, v. 51, p. 77–78.

Umney and Bennett: The crystalline form of sodium glycerophosphate contains 5 molecules of water. Solutions should be required to contain 75 per cent or 50 per cent of the anhydrous salt.—Pharm. J. 1914, v. 92, p. 135, and Year-Book of Pharmacy, 1914, p. 406.

Dubois, G.: The crystalline sodium glycerophosphate is the beta isomeride and contains 5½ molecules of water of crystallization.—Bull. Pharm. 1914, v. 28, p. 306. See also: J. Ind. & Eng. Chem. 1914, v. 6, p. 127.

François and Boismenu: The valuation of sodium glycerophosphate.—Ann. Falsif. 1914, v. 7, p. 430.

Liberati, T.: Of 15 lots examined only 1 was below the required 75 per cent of normal sodium glycerophosphate with 3 molecules of water.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 157.

SPIGELIA.

U. S. P. IX: The rhizome and roots may include not more than 10 per cent of stems and other foreign matter. Ash not exceeding 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 405, and Abstr. Prop. Changes, Part 2, 1914, p. 47.

Stockberger, W. W.: A large number of samples of spigelia examined recently proved to be spurious.—J. Am. Pharm. Assoc. 1914, v. 3, p. 33–34.

Rogers, C. H.: Sample of spigelia was found to consist of nearly 85 per cent of serpentaria.—Proc. Minnesota Pharm. Assoc. 1914, p. 141.

Lilly, J. K.: Adulteration and complete substitution with ruellia and various forms of phlox, together with unknown roots little resembling the genuine drug, has occurred regularly in samples of spigelia.—Proc. N. W. D. A. 1914, p. 264, and Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 35.

Roberts, J. G.: It is a difficult matter to obtain clean spigelia; an examination of several samples yielded 25.46 to 41.78 per cent of ash. One sample contained 20 per cent of ruellia and about 50 per cent of old and partially decayed spigelia rhizomes.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 156.

Baker, W. L.: Pink root was found to contain a large amount of earth and dirt.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

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Häussler, F.: The juice of the fresh plant of spigelia has long been used by the natives of Haiti as a vermifuge.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 275.

SPIRITUS.

U. S. P. IX: Changes and new standards for spiritus.—J. Am. Pharm. Assoc. 1914, v. 3, p. 526–527, and Abstr. Prop. Changes, Part 3, 1914, p. 3–4.

Mittelbach, Wm.: There will be but little change in the official spirits except in the rubric of those to be of certain strength by assay.—Proc. Missouri Pharm. Assoc. 1914, p. 106.

Curry, Gordon L.: Of the 20 official spirits 16 can readily be prepared in the retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 58.

Lythgoe, Hermann C.: Seven hundred and forty-nine of the various forms of spirits were examined, of which 129 were adulterated.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 409.

SPIRITUS ÆTHERIS COMPOSITUS.

Brown, L. A.: Five samples of compound spirit of ether analyzed. Four passed and one adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 118.

SPIRITUS ÆTHERIS NITROSI.

Xrayser II: The title "sweet spirit of nitre," like the popular synonym for tincture of opium, has a somewhat curious history. It was in use long before the preparation was made official. The preparation was first made in England in 1846.—Chem. & Drug. 1914, v. 85, p. 755.

U. S. P. IX: Rubric to read not less than 3.5 nor more than 4 per cent of ethyl nitrite.—J. Am. Pharm. Assoc. 1914, v. 3, p. 526, and Abstr. Prop. Changes, Part 3, 1914, p. 3.

La Pierre, E. H.: The manufacture of spirit of nitrous ether.—Apothecary, 1914, v. 26, August, p. 22.

Bradley, T. J.: Assay of spirit of nitrous ether, with description of a modified nitrometer.—Proc. Massachusetts Pharm. Assoc. 1914, p. 91–93; also J. Am. Pharm. Assoc. 1914, v. 3, p. 1442, and Merck's Rep. 1914, v. 23, p. 296.

Dott, D. B.: The estimation of spirit of nitrous ether and a note on an old sample of spirit of nitrous ether.—Pharm. J. 1914, v. 92, p. 164. For discussion see p. 186. See also Chem. & Drug. 1914, v. 84, p. 240, and Merck's Rep. 1914, v. 23, p. 140.

Kemsey-Bourne, C. W.: The testing of spirit of nitrous ether. The systematic testing of this preparation by the nitrometer is the only safe procedure.—Pharm. J. 1914, v. 92, p. 125.

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Hodgson, T. R.: Comparative study of the deterioration of spirit of nitrous ether.—Pharm. J. 1914, v. 92, p. 28.

Porter, C. S.: Spirit of nitre will keep pretty well at a temperature of 50°, but deteriorates at higher temperatures.—Proc. Kentucky Pharm. Assoc. 1914, p. 112.

Todd, A. R.: By experimentation it has been shown many times that "spirits of nitre" may be kept in perfect condition for a number of months if kept in accordance with the U. S. P.—Rep. D. & F. Com. Michigan, 1914, p. 191.

Brown, Lucius P.: Spirit of nitrous ether should be preserved strictly in accordance with the instructions included in the Pharmacopœia.—Bull. Tennessee F. & D. Dept. 1914, v. 1, p. 23. See also Drug Circ. 1914, v. 58, p. 487.

Anon.: Experiments show that ethyl nitrite decomposes very rapidly in the presence of an excess of water.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 417. See also Chem. & Drug. 1914, v. 85, p. 725.

Cowley, R. C.: The deterioration of spirit of nitrous ether. This preparation keeps wonderfully well, even at a relatively high temperature, when the stopper is only occasionally removed.—Pharm. J. 1914, v. 92, p. 461.

Table showing some of the analytical results reported for spirit of nitrous ether.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	2	2	Rep. Indiana Bd. Health, 1914, p. 442.
Brown, L. A.	20	15	Proc. Kentucky Pharm. Assoc. 1914, p. 118.
Brown, L. P.	4	2	Bull. Tennessee F. & D. Dept. 1914, v. 1, No. 1, p. 27.
Congdon, Leon A.	22	22	Rep. Kansas Bd. Health, 1914, p. 100.
Frary, Guy G.	85	63	Rep. South Dakota F. & D. Com. 1914, p. 228, 267, 338.
Jackson, Cook, and Strickland	1	1	Rep. Rhode Island F. & D. Com. 1914, p. 16.
Lythgoe, H. C.	134	46	Rep. Massachusetts Bd. Health, 1913, 1914, p. 418.
Newcomb, G. D.	1	1	Proc. Iowa Pharm. Assoc. 1914, p. 28.
Sayre, L. E.	7	5	Bull. Kansas Bd. Health, 1914, v. 10, p. 26.
Stallings, R. E.	3	2	Bull. Georgia Dept. Agric. 1914, v. 1, p. 19.
Todd, A. R.	24	11	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R.	16	8	Bull. Michigan D. & F. Com. 1914, January-February, p. 17, March-April, p. 19, November-December, p. 22.
Wiedemann, H. E.	21	20	Rep. Missouri F. & D. Com. 1914, p. 39.
Woods, Chas. D.	60	47	Off. Insp. Maine Agric. Exper. Sta. 1913, No. 46, p. 26–28, 1914, No. 61, p. 97–100.

Anon.: Sweet spirit of nitre is one of the oldest of household remedies for colds and fevers.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 416–417.

Editorial: As a remedy for acute and ephemeral febrile attacks in little children, spirit of nitrous ether is frequently useful.—Eclectic M. J. 1914, v. 74, p. 103.

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SPIRITUS AMMONIÆ.

Weinstein, Joseph: Of 15 samples of spirit of ammonia collected on prescriptions, only 9 proved to be the alcoholic solution of ammonia.—Proc. New York Pharm. Assoc. 1914, p. 115.

SPIRITUS AMMONIÆ AROMATICUS.

Egan, T. H.: In making the aromatic spirit of ammonia, the alkaline solution should be allowed to stand for 12 hours and the alcoholic solution of the oils for 48 hours before mixing.—Am. Druggist, 1914, v. 62, p. 243.

Mills, Ralph: The U. S. P. order of mixing the solution should be reversed; the alcoholic solution of the oils gradually added to the alkaline solution. In this way a clear solution can be obtained at once.—Southern Pharm. J. 1914, v. 6, p. 536.

Brown, L. A.: Ten samples of aromatic spirit of ammonia analyzed; 1 passed and 9 adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 118.

Ziefle, Adolph: Of 94 samples of aromatic spirit of ammonia examined, 71 were not within 10 per cent of official strength.—Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 138–141.

SPIRITUS FRUMENTI.

Remington, J. P.: Among the questions still to be decided is the admission of whisky into the Pharmacopœia and the manner in which it is to be made official.—Proc. N. A. M. M. P. 1914, p. 32; also Am. Druggist, 1914, v. 62, p. 89, and Proc. Minnesota Pharm. Assoc. 1914, p. 87.

Frary, Guy G.: Some time could well be spent in examining the quality of liquor sold in the State.—Rep. South Dakota F. & D. Com. 1914, p. 10.

Barnard, H. E.: Of 15 samples of whisky examined, 2, or 13.3 per cent, were found to be illegal.—Rep. Indiana Bd. Health, 1914, p. 396.

Beythien and Hempel: Of 84 samples of whisky, 3 were found to be factitious products in that they contained so-called essences.—Pharm. Zentralh. 1914, v. 55, p. 438–439.

Williams, Edward Huntington: The liquor question in medicine.—Med. Rec. 1914, v. 85, p. 612–614.

SPIRITUS GLYCERYLIS NITRATIS.

U. S. P. IX: Rubric to read not less than 1, nor more than 1.1 per cent by weight of glyceryl trinitrate. Tests for identity and purity modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 526, and Abstr. Prop. Changes, Part 3, 1914, p. 3.

Digitized by Google

Heyl and Staley: Notes on the estimation of nitroglycerin. A comparison of the Kjeldahl method with the method proposed by Scoville shows the latter to be generally the more satisfactory.—Am. J. Pharm. 1914, v. 86, p. 195–198.

E'we, G. E.: Of two lots of 10 per cent nitroglycerin solution examined, one tested 9.25 and the other 10.3 per cent nitroglycerin.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 147.

Snider, H. F.: Report on the determination of nitroglycerin in tablets.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 201–204.

Kebler, L. F.: Outline of method for the determination of nitroglycerin in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1094–1095.

Rippetoe and Smith: Deterioration of nitroglycerin tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 96–97.

Kebler, L. F.: Tablets of nitroglycerin were found to contain 75 per cent of the amount claimed.—Proc. Kentucky Pharm. Assoc. 1914, p. 135.

Congdon, Leon A.: Four samples of nitroglycerin tablets were below standard.—Rep. Kansas Bd. Health, 1914, p. 100.

Todd, A. R.: Of seven samples of tablet triturates of nitroglycerin examined, four were found to be adulterated or misbranded.—Rep. Michigan D. & F. Com. 1914, p. 176.

Todd, A. R.: Of six samples of tablet triturates of nitroglycerin examined, four were found to be adulterated or illegal.—Bull. Michigan D. & F. Dept. 1914, January–February, p. 17, March–April, p. 19.

Ebright, George E.: The effects of nitroglycerin on those engaged in its manufacture.—J. Am. M. Assoc. 1914, v. 62, p. 201–202.

Macht, D. I.: Action of the nitrites on the isolated surviving pulmonary artery.—J. Am. M. Assoc. 1914, v. 62, p. 524. See also J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 23.

Braun, Israel: Nitroglycerin, alone or combined with morphine, or atropine is very useful in bronchial asthma for its vasodilator effect.—Merck's Arch. 1914, v. 16, p. 107.

SPIRITUS VINI GALLICI.

Alsberg, C. L.: Spurious brandy under misleading labels has for years been imported. Its importation has been stopped.—Am. Food J. 1914, v. 9, p. 21.

Emerson, R. L.: The labeling of cognac type of brandy.—S. R. A.-Chem. 1914, p. 113.

Alpers, Karl: Official regulations in connection with the trade in cognac and cognac blends.—Pharm. Ztg. 1914, v. 59, p. 796–797.

Häussler, E. P.: A contribution to our knowledge of the "ripening" of cognac.—Ztschr. öffentl. Chem. 1914, v. 20, p. 184–197.

Digitized by Google

Alsberg, C. L.: The bearing of Food Inspection Decision No. 152 on the distillation of brandy from pomace and other wine by-products.—S. R. A.-Chem. 1914, p. 113.

Ofner and Fortner: The determination of the higher alcohols in cognac by means of the reaction proposed by Komarowsky.—Arch. Chem. Mikros. 1914, v. 7, p. 195–201.

Rosenfeld, Rudolf A. P.: On the specificity of alcohol habituation.—Ztschr. Immun. u. exper. Therap. 1914, v. 21, p. 228–230.

SPIRITUS MYRCIÆ, N. F.

Williams, Ed. E.: Use magnesium carbonate as a filtering agent in the formula for bay rum of the N. F. This renders it a shade alkaline and brings out the color.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Watts, Francis: The bay leaf oil industry of the West Indies, with illustrations.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 425–427.

Beringer, George M.: A proposed N. F. monograph for Oleum Myrciæ, oil of myrcia; oil of bay. A volatile oil distilled from the leaves of *Pimenta acris* Wight. It should be kept in small well-stoppered amber-colored bottles, in a cool place, protected from light.—J. Am. Pharm. Assoc. 1914, v. 3, p. 876.

Jensen, H. R.: Twenty-two samples of bay oil of varying purity had a specific gravity of from 0.914 to 1.0025; refractive index of from 1.4952 to 1.5194; optical rotation of from −4.30° to +3.30°; and phenols from 25 to 70 per cent.—Evans' An. Notes, 1914, p. 10.

Mann, E. W.: A low percentage of phenols characterized one sample of oil of bay examined, the oil being either a partial distillate or reduced with the by-product resulting from the manufacture of the terpeneless oil.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 28.

Table showing some of the analytical results reported for bay rum.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	3	0	Rep. Indiana Bd. Health, 1914, p. 443.
Congdon, L. D.	3	2	Rep. Kansas Bd. Health, 1914, p. 100.
Stadtmueller, F. H.	2	1	Rep Connecticut D. & F. Com. 1914. p. 15.
Street, J. P.	8	1	Rep. Connecticut Agric. Exper. Sta. 1914, p. 248.
Strode, S. E.	17	12	Rep. Ohio D. & F Div. 1914, p. 118

STAPHISAGRIA.

U. S. P. IX: The drug may include not more than 2 per cent of foreign vegetable matter. Description elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 406, and Abstr. Prop. Changes, Part 2, 1914, p. 48.

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Rippetoe, J. R.: One sample of staphisagria was found to contain 25.85 per cent of alcohol extract and 21.80 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Jensen, H. R.: One sample of stavesacre seeds was found to leave 21.2 per cent of ash.—Evans' An. Notes, 1914, p. 66.

Williams, J. B.: The insecticidal value of fluid extract of larkspur seed.—Am. J. Pharm. 1914, v. 86, p. 414–416.

Editorial: The influence of staphisagria upon the mucous lining of the bladder and urethra is well defined and when the remedy is properly administered its action is reliable.—Ellingwood's Therap. 1914, v. 8, p. 69. See also Am. J. Clin. Med. 1914, v. 21, p. 244–245.

STILLINGIA.

U. S. P. IX: Description elaborated. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 406, and Abstr. Prop. Changes, Part 2, 1914, p. 48.

Rippetoe, J. R.: Four samples of stillingia were found to contain from 11.32 to 14.32 per cent of alcohol (49 per cent) extract and from 4.05 to 6.72 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Maines, E. L.: Stillingia root was found to contain from 4.47 to 5.81 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

STRAMONIUM.

U. S. P. IX: The dried leaves of *Datura stramonium* with not more than 10 per cent of stems and other foreign matter. Ash not exceeding 20 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 407, and Abstr. Prop. Changes, Part 2, 1914, p. 49.

Henkel, Alice: An illustrated description of *Datura stramonium* L.—Phys. Drug News, 1914, v. 9, p. 158; also Spatula, 1914, v. 20, p. 472.

Mansfield, William: An illustrated description of jimsonweed, *Datura stramonium*.—Pract. Drug. 1914, v. 32, p. 12. See also Kremers, Edward: Bull. Wisconsin Univ. 1914, No. 738, p. 12.

Anon.: A general description of stramonium, the assay of stramonium, and the uses and therapeutic effect of the drug.—Southern Pharm. J. 1914, v. 6, p. 210.

Kremers, Edward: Experiments with something like 15 or 20 species and varieties of stramonium have demonstrated that practically all of them are attacked by beetles.—J. Am. Pharm. Assoc. 1914, v. 63, p. 1440.

Caesar & Loretz: The valuation of stramonium with table showing the requirements for this drug included in the several pharmacopœias.—Jahres-Ber. 1914, p. 86.

Digitized by Google

U. S. P. IX: Method of assay slightly modified.—J. Am. Pharm. Assoc. 1914, v. 3, p. 996, and Abstr. Prop. Changes, Part 4, 1914, p. 13.

Miller, F. A.: Observations on the breeding of stramonium plants to increase the alkaloid content.—Lilly Sci. Bull. 1914, Ser. 1, p. 130. See also Miller and Meader, p. 156–162.

Langenhan, H. A.: The alkaloidal content of stramonium leaves, with a table showing a compilation of the results obtained by various investigators and a comprehensive bibliography.—Bull. Wisconsin Univ. 1914, No. 738, p. 53–80.

Vanderkleed, C. E.: Reports 11 assays of stramonium leaf; from 0.304 to 0.520 per cent mydriatic alkaloids.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

Roberts, J. G.: All but two of the eight samples examined conformed to the U. S. P. standard of not less than 0.25 per cent of mydriatic alkaloid.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 158.

Caesar & Loretz: One sample of stramonium was found to contain 0.342 per cent of mydriatic alkaloids and 19.67 per cent of ash.—Jahres-Ber. 1914, p. 38.

Maines, E. L.: Stramonium leaves were found to contain from 21.04 to 27.80 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

Mann, E. W.: Ash yield of two samples of powdered foreign stramonium leaves was found to be 19.70 and 21.50 per cent, respectively.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 25.

J. D. Riedel, A.-G.: Stramonium contained from 15.5 to 19.6 per cent of ash and from 20.7 to 25.2 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 32.

U. S. P. IX: One gm. of the extract or of the powdered extract to represent 4 gm. of the drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 537, and Abstr. Prop. Changes, Part 3, 1914, p. 14.

U. S. P. IX: The tincture to be assayed before being finished.—J. Am. Pharm. Assoc. 1914, v. 3, p. 548, and Abstr. Prop. Changes, Part 3, 1914, p. 25.

Braun, Israel: Among the group of remedies consisting of belladonna, hyoscyamus, stramonium, and lobelia, the first named is the most serviceable in the treatment of bronchial asthma.—Merck's Arch. 1914, v. 16, p. 106.

Fearn, John: Stramonium, also known by the common names of thorn apple, stinkweed, and Jamestown weed, is a powerful and beneficent remedy.—Eclectic M. J. 1914, v. 74, p. 294–295.

STRONTII BROMIDUM.

Hill, C. A.: Of 33 samples of strontium bromide examined during the years 1911 to 1913, inclusive, the lead content varied from 0 to 8 parts per million. The arsenic content varied from 0 to 0.6 parts per million.—Chem. & Drug. 1914, v. 85, p. 22.

Digitized by Google

Becker, Henry C.: Strontium bromide has no special virtue and no advantages over other bromides. There is no special advantage in a mixed bromide.—Merck's Arch. 1914, v. 16, p. 35.

STRONTII SALICYLAS.

Baker, W. L.: Two lots of strontium salicylate were rejected, as color was decidedly pink.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

STROPHANTHINUM.

Brauns and Closson: On crystalline Kombé strophanthin. The properties, molecular composition, and decomposition products of strophanthin.—Arch. Pharm. 1914, v. 252, p. 294–340. Also Pharm. Zentralh. 1914, v. 55, p. 1033–1035.

Haskell and Doeppers: The stability of ouabain in aqueous solution.—J. Am. Pharm. Assoc. 1914, v. 3, p. 646–648.

Ginzberg and Hohlberg: A contribution on the physiological standardization of heart tonics.—Compt. rend. Congr. Internat. Pharm. 1913, v. 1, p. 559–613. See also Joanin, A., p. 614–640.

Holste, Arnold: The valuation of heart tonics by means of the isolated frog's heart.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 385–408.

Clark, A. J.: The mode of action of strophanthin upon cardiac tissue.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 215–234.

Weiss, Edmund: The physiological valuation of strophanthus and the several strophanthins.—Pharm. Post, 1914, v. 47, p. 339–342, 351–354, 360–365.

Johannessohn, Fritz: On the behavior of the strophanthins in the intestinal tract. I. The reputed cleavage of strophanthin by ferments. II. The detection of strophanthins in the stomach and in the intestine.—Arch. exper. Path. u. Pharmakol. 1914, v. 78, p. 82–98.

Gottschalk, Gertrud: The action of strophanthin on the oxygen consumption of the frog heart.—Arch. exper. Path. u. Pharm. 1914, v. 75, p. 33–42.

For additional comments on strophanthin see Zentralbl. Biochem. Biophys.; Biochem. Ztschr.; Zentralbl. exper. Med.; Index Med.; J. Am. M. Assoc.

STROPHANTHUS.

U. S. P. IX: The dried ripe seeds of *Strophanthus kombé*, or of *Strophanthus hispidus*, deprived of the long awn. Ash not exceeding 5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 407, and Abstr. Prop. Changes, Part 2, 1914, p. 49.

Baker, W. L.: Strophanthus seeds were found to be very damp and musty.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Digitized by Google

Matthes and Rath.: An examination of the oil of strophanthus.—Arch. Pharm. 1914, v. 252, p. 683–693. See also Haiduschka and Wallenrenter, p. 704–708.

Caesar & Loretz: The determination of strophanthin in strophanthus by the Fromme method.—Jahres-Ber. 1914, p. 109–111.

J. D. Riedel, A.-G.: Strophanthus contained from 3.8 to 4.8 per cent of ash and from 22.5 to 25.1 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

Linke, H.: Strophanthus seed was found to contain from 3.8 to 6.8 per cent of total ash and from 0.4 to 1.8 per cent of ash insoluble in hydrochloric acid.—Apoth.-Ztg. 1914, v. 29, p. 673.

U. S. P. IX: The tincture is to be made from No. 40 powder. Percolated with purified petroleum benzin and subsequently extracted with alcohol.—J. Am. Pharm. Assoc. 1914, v. 3, p. 548, and Abstr. Prop. Changes, Part 3. 1914, p. 25.

Delaye, L.: A comparison of the requirements for the preparations of strophanthus included in the British, Chilean, Mexican, French, Swiss, and Roumanian Pharmacopœias and the International Conference Protocol.—Rev. Internat. Pharm. Brux. 1914, v. 2, p. 178.

Pearson, William A.: The physiological testing of heart tonics.—Hahnemann. Month. 1914, v. 49, p. 106–116.

Ginzberg and Hohlberg: A contribution on the physiological standardization of heart tonics.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 1, p. 559–613. See also Joanin, A., p. 614–640.

Holste, Arnold: The valuation of heart tonics. Digitalis, strophanthus, strophanthin, cymarin.—Ztschr. exper. Path. u. Therap. 1914, v. 15, p. 385–408.

Weis, Edmund: The physiological valuation of strophanthus and the several strophanthins.—Pharm. Post, 1914, v. 47, p. 339–342, 351–354, 360–365.

Vanderkleed and Pittenger: Variation in susceptibility of the guinea pig.—J. Am. Pharm. Assoc. 1914, v. 3, p. 815–819.

Gunn, J. W. C.: The influence of temperature on the action of strophanthin on the mammalian heart.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 39–44.

Caesar & Loretz: A review of the work by Lampert and Müller on the valuation of strophanthus.—Jahres-Ber. 1914, p. 27.

Janeway, Theodore C.: The comparative value of cardiac remedies, including a study of the action of strophanthin, digitalis, caffeine, and its allies.—Arch. Int. Med. 1914, v. 13, p. 361–383.

Johannessohn and Schaechtl: A clinical contribution to the strophanthus question. A comparison of the action of strophanthus and of digitalis.—Deutsch. med. Wchnschr. 1914, v. 40, p. 1412–1414.

See also under "Strophanthinum."

Digitized by Google

Einbeck, Hans: Progress in the chemistry of the strychnos alkaloids in 1913.—Fortschr. Chem. 1914, v. 9, p. 189.

Dott, D. B.: Estimation of strychnine in the presence of brucine.—Pharm. J. 1914, v. 92, p. 120; also Year-Book of Pharmacy, 1914, p. 331–332.

Simmonds, Charles: The estimation of strychnine in the presence of quinine.—Analyst. 1914, v. 39, p. 81–83.

Mameli, Efisio: Substances which tend to mask the color reaction of strychnine.—Boll. chim.-farm. 1914, v. 53, p. 366–369.

Guérin, G.: The employment of magnesium carbonate for the detection of traces of strychnine.—J. pharm. et chim. 1914, v. 9, p. 595–597. See also Denigès, G.: Bull. Soc. pharm. Bordeaux, 1914, v. 54, p. 289–293.

Gordin and Kaplan: Report of an attempt to facilitate the removal of strychnine from the precipitate obtained by adding Lloyd's reagent to a solution of a salt of the alkaloid in water.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1657, and Merck's Rep. 1914, v. 23, p. 296.

Marden and Elliott: For the extraction of strychnine from aqueous solution chloroform is better than mixtures of chloroform and ether, as suggested by many authors.—J. Ind. & Eng. Chem. 1914, v. 6, p. 933–934.

Wasicky, R.: The microchemical detection of strychnine and brucine in the seeds of strychnos nux vomica.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 35, 42, 53, 67.

Finnemore and Williamson: The incompatibility of strychnine and nux vomica with alkalies, iodides, and bromides.—Pharm. J. 1914, v. 92, p. 124–125. For discussion see p. 153. See also Year-Book of Pharmacy, 1914, p. 346–351, 351–355, and Merck's Rep. 1914, v. 23, p. 242–243.

Leuches and Schwaebel: A further contribution on strychnos alkaloids, with observations on acetyl-strychninolins and the finding of an isomeric strychninolin.—Ber. deutsch. chem. Gesellsch. 1914, v. 47, p. 1552–1560.

Chevalier, J.: The pharmacodynamic action of several synthetic derivatives of strychnine. The alkyl betaines of strychnic acid.—Nouv. remèdes, 1914, v. 31, p. 241–248.

McGuigan and Becht: The site of the action of strychnine.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 469–478.

Githens and Meltzer: The convulsant action of strychnine and morphine in cardiectomized frogs after destruction of the anterior lymph hearts.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 96.

McGuigan, Hugh: A colloidal compound of strychnine and its pharmacology.—J. Am. M. Assoc. 1914, v. 63, p. 1933–1936.

Digitized by Google

Fantus, Bernard: The antidotal value of fuller's earth in strychnine poisoning.—J. Am. M. Assoc. 1915, v. 64, p. 1841–1842.

Paulucci, P.: Observations on the influence of oils and of vaseline on the toxicity of strychnine. A comprehensive bibliography on the detoxication of strychnine.—Arch. farmacol. sper. 1914, v. 18, p. 486–516.

Kuenzer, Rudolf: On the resorption and elimination of strychnine following parenteral injection of the strychnine in the guinea pig.—Arch. exper. Path. u. Pharmakol. 1914, v. 77, p. 241–250.

Krug: The qualitative physiological determination of strychnine.—Vrtljschr. ger. Med. 1914, v. 48, p. 248–259.

Newburgh, L. H.: In the treatment of cardiovascular disturbances, strychnine does not improve or augment the work of the heart in persons suffering from broken cardiac compensation.—J. Am. M. Assoc. 1914, v. 63, p. 311–313, and Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 84–91.

Poffenberger, A. T.: A comparison of the effects of caffeine and strychnine on mental and motor efficiency. The rather prevalent use of strychnine among brain workers as a mental stimulant finds no support in the conclusions from these researches.—Therap. Gaz. 1914, v. 38, p. 341–345.

Glenn, William S., jr.: The uses of strychnine salts are those of a spinal stimulant, with power of aiding the nerve force, by increasing the nutrition of the nervous system.—Eclectic M. J. 1914, v. 74, p. 353.

For additional comments on strychnine see Zentralbl. Biochem. Biophys.; Zentralbl. exper, Med.; Index Med.; J. Am. M. Assoc.

STRYCHNINÆ SULPHAS.

Kebler, L. F.: Outline of method for the determination of strychnine sulphate in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1098.

Brown, L. A.: Eight samples of strychnine sulphate tablets analyzed; six passed and two adulterated.—Proc. Kentucky Pharm. Assoc. 1914, p. 116.

Dejussieu, Michel: A note on the preparation of solutions of strychnine sulphate for injection.—Bull. Pharm. sud-est, 1914, v. 19, p. 241-242.

STRYCHNINE VALERATE.

Beringer, George M.: A proposed monograph for strychnine valerate, the valerate of the alkaloid strychnine. On incinerating 1 gm. the ash should not exceed 0.1 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1601.

Digitized by Google

STYRAX.

Mann, E. W.: An investigation into the quality of commercial supplies of storax.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 23–25.

Jensen, H. R.: Five samples of storax yielded 12.2 to 20 per cent cinnamic acid; 3.8 to 5 per cent alcohol insoluble material; and 0.4 to 1.1 per cent ash.—Evans' An. Notes, 1914, p. 66.

E'we, G. E.: Of the eight lots of storax examined, seven ranged from 70 to 88.9 per cent of nonvolatile alcohol-soluble matter.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 158.

SUCCUS.

Succus Citri.—Beringer, George M.: A proposed N. F. monograph for Succus Citri, lime juice. The expressed juice of the ripe fruit of *Citrus medica, var. acida* Linné. One hundred cc. should contain from 5 to 10 gm. of total acids, calculated as crystallized citric acid.—J. Am. Pharm. Assoc. 1914, v. 3, p. 878.

Lilly, J. K.: A recent shipment of lime juice was found to contain both sulphur dioxide and salicylic acid.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Succus Pomorum.—Beringer, George M.: A proposed N. F. monograph for Succus Pomorum, fresh apple juice. The freshly expressed juice of sound, ripe, sour apples, the fruit of cultivated varieties of *Pyrus malus* Linné.—J. Am. Pharm. Assoc. 1914, v. 3, p. 879.

SULPHONETHYLMETHANUM.

Wilbert, M. I.: Trional and methylsulphonalum are the titles used in continental pharmacopœias for sulphonethylmethanum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 654.

Anon.: The Ph. Brit. V includes methylsulphonal, or diethy-sulphone-methyl-ethyl methane, better known as trional.—Chem. & Drug. 1914, v. 85, p. 487. See also Williams, Joseph H.: Pharm. J. 1914, v. 93, p. 293.

SULPHONMETHANUM.

Wilbert, M. I.: With the exception of the Ph. Brit., sulphonal is the recognized title for sulphonmethanum in foreign pharmacopœias.—J. Am. Pharm. Assoc. 1914, v. 3, p. 654.

Anon.: Outline of method for making sulphonal.—Southern Pharm. J. 1914, v. 7, p. 61. See also Williams, Joseph H.: Pharm. J. 1914, v. 93, p. 294.

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E'we, G. E.: One lot of sulphonal melted at 124°, instead of at 125.5° required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 158.

Biachini, Gino: On the incompatibility existing between salol, sulphonal, and beta naphthol.—Atti accad. Lincei, 1914, v. 23, p. 608–615; also J. Soc. Chem. Ind. 1914, v. 33, p. 612.

SULPHUR.

Vail, Richard H.: New sources of sulphur in the south; an abstract.—Chem. Eng. 1914, v. 19, p. 18–22.

Hall, W. A.: Process for the extraction of sulphur from metallic sulphides (other than iron pyrites). English Patent 26,595, September 11, 1912.—J. Soc. Chem. Ind. 1914, v. 33, p. 135. See also p. 137, 485, and Feld, W., p. 692.

Hanson, C.: U. S. Patent 1,101,740. Sulphur and sulphates from sulphites.—J. Ind. & Eng. Chem. 1914, v. 6, p. 969.

Eumofopoulos, N.: The boiling point of sulphur on the thermodynamic scale.—Proc. Roy. Soc. Lond. Ser. A, 1914, v. 90, p. 189–203.

Seidell and Meserve: The determination of sulphur dioxide in air by aspiration methods, iodometric methods, and direct iodine titration methods.—Bull. Hug. Lab. No. 92, 1914, p. 9–17.

Peterson, W. H.: Forms of sulphur in plant materials and their variation with the soil supply.—J. Am. Chem. Soc. 1914, v. 36, p. 1290–1300.

Lewis and Randall: The free energy of the various forms of elementary sulphur.—J. Am. Chem. Soc. 1914, v. 36, p. 2468–2475.

Tartar, Herman V.: The reaction between sulphur and calcium hydroxide in aqueous solution.—J. Am. Chem. Soc. 1914, v. 36, p. 495–498.

Fabricius, Eugen: The toxicity of sulphur combinations in the human organism.—Pharm. Zentralbl. 1914, v. 55, p. 319–321; also J. Pharm. Alsass-Lothr. 1914, v. 41, p. 88–90.

Taegen, H.: Cause of the laxative action.—Nat. Druggist, 1914, v. 44, p. 242.

SULPHUR PRÆCIPITATUM.

Noyes, C. R.: The commercial grade of precipitated sulphur is called "Lac Sulphur." "Lac Sulphur," as it now appears on the market, is derived from the surface sulphur beds without purification. It is not precipitated, but shoveled, and does not contain more than 40 or 50 per cent of sulphur.—J. Am. Pharm. Assoc. 1914, v. 3, p. 853; also Proc. Minnesota Pharm. Assoc. 1914, p. 189.

Lythgoe, Hermann C.: Of 31 samples of precipitated sulphur examined, 4 were found to be adulterated.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 411.

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Hill, C. A.: Of 38 samples of precipitated sulphur examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0 to 1.6 parts per million.—Chem. & Drug. 1914, v. 85, p. 23.

SULPHUR SUBLIMATUM.

U. S. P. IX: Sublimed sulphur replaces washed sulphur; otherwise no change.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1579, and Abstr. Prop. Changes, Part 6, 1914, p. 17.

Hill, C. A.: Of 65 samples of sublimed sulphur examined during the years 1910 to 1913, inclusive, the arsenic content varied from 0 to 1 part per million.—Chem. & Drug. 1914, v. 85, p. 23.

SUMBUL.

U. S. P. IX: The roots of *Ferula sumbul.* Description elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 408, and Abstr. Prop. Changes, Part 2, 1914, p. 50.

Maines, E. L.: Musk root was found to contain from 6.01 to 8.27 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Rippetoe, J. R.: One sample of sumbul was found to contain 20.23 per cent of alcohol (70 per cent) extract and 4.72 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

U. S. P. IX: For fluid extract of sumbul, to direct the use of alcohol 4 volumes and water 1 volume as menstruum.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

SUPPOSITORIA.

U. S. P. IX: A description for making suppositories by cold compression.—J. Am. Pharm. Assoc. 1914, v. 3, p. 552, and Abstr. Prop. Changes, Part 3, 1914, p. 29.

Mittelbach, Wm.: In the U. S. P. IX: The process for making suppositories is to be improved. Instead of working the mixture into a mass and proceeding as if pills are to be made, the mixture is pressed into the proper forms.—Proc. Missouri Pharm. Assoc. 1914, p. 107.

Angresius, Roman E. V.: An improvement in suppositories; description of a new method of making and dispensing suppositories, and the use of a removable gelatin coating to protect the mass from melting.—Southern Pharm. J. 1914, v. 6, p. 244–245.

Hron, Ralph P.: The melting of glycerin suppositories in the body is not due entirely to body heat but also to the moisture present.—Pharm. Era, 1914, v. 47, p. 232.

Wulff and Hillen: An illustrated description of a bougie mold.—Phrm. Post, 1914, v. 47, p. 343. See also Apoth.-Ztg. 1914, v. 29, p. 323.

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SUPPOSITORIA GLYCERINI.

U. S. P. IX: To require that the dish in which the reaction occurs be thoroughly immersed in the boiling water and the contents protected as much as possible from the steam.—J. Am. Pharm. Assoc. 1914, v. 3, p. 552, and Abstr. Prop. Changes, Part 3, 1914, p. 29.

SYRUPI.

[NOTE.—Following Government Printing Office style, which is governed by Webster's International Dictionary, the spelling "sirup" is used in this publication.]

Anon.: To secure sirups of desirable quality, it is important that a quantity sufficient to last a reasonable length of time only me made.—N. A. R. D. Notes, 1914, v. 18, p. 370.

Sudro, W. F.: Pharmacists should pay close attention to all preparations in which sirup is a base; like all saccharin products, they are prone to deteriorate and when this change is noticed a fresh stock should be made up.—Rep. North Dakota F. Com. 1914, p. 31.

Curry, Gordon L.: All of the 29 official sirups should be made in the retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 59.

Windolph, J. Fred: Infection by bacteria, yeast fungus, or molds are responsible for changes in many solutions and sirups. Proc. Am. Assoc. Pharm. Chem. 1914, p. 222.

Vining, Dudley C.: An illustrated description of a simple apparatus for estimating fermentation in sirups.—Chem. & Drug. 1914, v. 84, p. 2.

Cochran and Perkins: The comparative values of some essential oils as preservatives of cane sugar solutions.—J. Ind. & Eng. Chem. 1914, v. 6, p. 304–306.

Anon.: The preservation of sirups has been a stumblingblock for many, principally because the sugar was of inferior quality or the sirup a little too thin or a little too heavy, or made in dirty vessels.—N. A. R. D. Notes, 1914, v. 17, p. 1028.

SYRUPUS.

U. S. P. IX: No change.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1575, and Abstr. Prop. Changes, Part 6, 1914, p. 13.

Anon.: In the making of simple sirup, the use of strictly pure cane sugar is a matter of great importance.—N. A. R. D. Notes, 1914, v. 18, p. 370.

Williams, Ed. E.: Confectioner's Crystal A sugar comes only in cane sugar and makes a sirup absolutely colorless and brilliantly clear.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Anon.: Sirup is best stored in bottles, so that no more than a small quantity, or sufficient to meet one's daily requirements, will be

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exposed to the action of the air for any great length of time.—Pacific Pharm. 1914, v. 7, p. 234.

Sudro, W. F.: Of 112 samples of simple sirup analyzed, many were found to be below strength.—Rep. North Dakota F. Com. 1914, p. 31.

SYRUPUS ACIDI HYDRIODICI.

Ziefle, Adolph: Of 53 samples of sirup of hydiodic acid examined. 24 were not within 10 per cent of standard. Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 148–149.

Brown, L. A.: Two samples of sirup of hydriodic acid analyzed. One passed and one misbranded.—Proc. Kentucky Pharm. Assoc. 1914, p. 118.

Thorburn, A. D.: One sample of sirup of hydriodic acid was 50 per cent below standard.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 212.

SYRUPUS BROMIDORUM, N. F.

Norwood, T. W.: In making compound sirup of bromides, the compound sirup of sarsaparilla should be replaced by a few ounces of sirup of tolu and a small amount of tincture of vanila.—Drug. Circ. 1914, v. 58, p. 390.

SYRUPUS CALCII LACTOPHOSPHATIS.

U. S. P. IX: For making sirup of calcium lactophosphate, the sugar has been reduced from 725 gm. to 650 gm. and 50 cc. of glycerin has been added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1576, and Abstr. Prop. Changes, Part 6, 1914, p. 14.

SYRUPUS FERRI IODIDI.

Alpers, W. C.: Observations on the making and preserving of sirup of ferrous iodide.—Nat. Druggist, 1914, v. 44, p. 297–298; also J. Am. Pharm. Assoc. 1914, v. 3, p. 420–423, and Merck's Rep. 1914, v. 23, p. 116.

Beringer, George M.: A note on the value of preservatives in sirup of iron iodide.—Am. J. Pharm. 1914, v. 86, p. 358–359; also Proc. New Jersey Pharm. Assoc. 1914, p. 51.

Llewellyn, H. D.: The present strength of the sirup is to be preferred, but the working directions of the 1890 Pharmacopœia were much simpler. Proc. Missouri Pharm. Assoc. 1914, p. 142.

Norwood, T. W.: The retailer who makes sirup of ferrous iodide according to the U. S. P. may have it declared illegal unless he assays his preparation.—N. A. R. D. Notes, 1914, v. 18, p. 1048; also Drug Circ. 1914, v. 58, p. 390.

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Mann, E. W.: A much improved formula for sirup of ferrous iodide is now official, glucose being used to inhibit the oxidation of the ferrous iodide.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 51–52.

Bohrisch, P.: Sirup of ferrous iodide may be produced in a practical way without the use of a catalizer. The preparation may be preserved by the addition of 0.5 per cent of citric acid.—Apoth.-Ztg. 1914, v. 29, p. 902; also Pharm. Zentralh. 1914, v. 55, p. 921.

Roth, Richard: Sirup of ferrous iodide will keep perfectly if exposed to direct sunlight, and therefore should be always kept in the window in small completely filled vials.—Southern Pharm. J. 1914, v. 6, p. 483.

Rupp, E.: The determination of halogen by silver nitrate, as suggested by the Brussels Conference, requires additional qualitative tests to show the absence of chlorine and bromine ions.—Südd. Apoth.-Ztg. 1914, v. 54, p. 322.

Fernau, Albert: For sirup of ferrous iodide, the determination of iodine by the Volhard method gives results that are generally satisfactory.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 264.

Porter, C. S.: Sirup of iodide of iron from solution of ferrous iodide.—Proc. Kentucky Pharm. Assoc. 1914, p. 61–62.

Table showing some of the analytical results reported for sirup of ferrous iodide.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	2	0	Rep. Indiana Bd. Health, 1914, p. 443.
Brown, L. A.	22	7	Proc. Kentucky Pharm. Assoc. 1914, p. 118.
Todd, A. R.	2	1	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R.	1	1	Bull. Michigan D. & F. Dept. 1914, January-February, p. 17.
Ziefle, Adolph	72	22	Rep. North Dakota Agric. Exper. Sta. 1912, 1914, p. 135–136.

SYRUPUS HYPOPHOSPHITUM.

U. S. P. IX: The sugar has been reduced from 650 gm. to 600 gm., 50 cc. of glycerin added, and the tincture of fresh lemon peel omitted. The alternative percolation method has been omitted.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1576, and Abstr. Prop. Changes, Part 6, 1914, p. 14.

Nixon, C. F.: The solution of hypophosphites should be allowed to stand 48 hours and filtered before dissolving the sugar.—Apothecary, 1914, v. 26, January, p. 20.

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SYRUPUS HYPOPHOSPHITUM COMPOSITUS.

Egan, T. H.: Compound sirup of hypophosphites is a source of trouble. Fermentation is caused by insufficient amount of sugar. This may be overcome by replacing 4 fluid ounces of water with glycerin.—Am. Druggist, 1914, v. 62, p. 243.

Williams, Ed. E.: The compound sirup of hypophosphites is not a stable preparation and experiments should be undertaken to furnish a more satisfactory article.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

SIRUP OF IODOTANNIN.

Marchand, Ch.: Formulas and methods for making sirup of iodotannin.—Farm. Españ. 1914, v. 46, p. 279–281.

Henry, C.: The determination of iodine in preparations of iodotannin extracts for sirup.—Répert. pharm. 1914, v. 26, p. 149–151.

SYRUPUS PAPAVERIS, N. F.

Amos, W. S.: Sirup of poppy could well be replaced with a sirup of morphine hydrochloride.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

SYRUPUS PHOSPHATUM COMPOSITUS, N. F.

Williams, Ed. E.: Sirup of phosphates compound should be kept on ice, and is a permanent preparation when so stored.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Hensel, Samuel T.: In making compound sirup of the phosphates N. F. it is necessary to eliminate all the liberated carbon dioxide to secure a preparation that will be at all satisfactory.—J. Am. Pharm. Assoc. 1914, v. 3, p. 232–233.

SYRUPUS PINI STROBI COMPOSITUS, N. F.

Llewellyn, H. D.: The general use of sirup of white-pine compound makes this preparation sufficiently important to be admitted to the Pharmacopœia under its present formula and working directions.—Proc. Missouri Pharm. Assoc. 1914, p. 143.

Snider, H. F.: Sirup of white-pine compound is a very much abused formula and very misleading to physicians.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 194.

Hensel, S. T.: Observations on the cause of instability of the compound sirup of phosphates, with a suggestion for a modified formula.—Merck's Rep. 1914, v. 23, p. 38–39.

Editorial: Compound sirup of white pine is not adapted to popular use on account principally of its morphine content.—Drug. Circ. 1914, v. 58, p. 203.

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Herb, Joseph: Compound sirup of white pine, particularly the combination with tar, is a satisfactory cough remedy.—Drug. Circ. 1914, v. 58, p. 203–204.

TALCUM.

Noyes, C. R.: Talcum is called French chalk. It is, of course, not chalk, and has not the slightest chemical relation to chalk. Nevertheless as sold it may contain calcium and magnesium carbonates.—J. Am. Pharm. Assoc. 1914, v. 3, p. 854; also Proc. Minnesota Pharm. Assoc. 1914, p. 191.

News Note: The total marketed production of talc for 1913 was 149,371 short tons.—Oil, Paint & Drug Rep. 1914, v. 85, August 10, p. 19.

Richter, Ernst: Two samples of talcum on heating became dark gray.—Apoth.-Ztg. 1914, v. 29, p. 211.

Caesar & Loretz: The determination of iron in talcum by treating it with salicylic acid.—Jahres-Ber. 1914, p. 112.

Thalberg, Friedrich: The use of talc as a lubricant.—Chem. Ztg. 1914, v. 38, p. 711–712.

Kebler, L. F.: Outline of method for the determination of talcum in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1081.

TARAXACUM.

U. S. P. IX: Description elaborated. Ash not exceeding 10 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 408, and Abstr. Prop. Changes, Part 2, 1914, p. 50.

Roberts, J. G.: One shipment of dandelion root contained about 25 per cent of chicory.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 137.

News Note: Three bags of drugs, marketed as dandelion root, were found to consist in substantial part of chicory.—Pharm. Era, 1914, v. 47, p. 580.

Rippetoe, J. R.: Two samples of taraxacum were found to contain 32.14 and 37.96 per cent of alcohol (49 per cent) extract and 11.40 and 8.37 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Maines, E. L.: Dandelion root was found to contain from 3.03 to 15.30 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Taraxacum root and herb contained from 12 to 14.8 per cent of ash and from 41.9 to 45.2 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 33.

U. S. P. IX: First menstruum for fluid extract to consist of a mixture of glycerin 100 cc., alcohol 500 cc., and water 400 cc.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

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TEREBENUM.

E'we, G. E.: Four lots of terebene examined were slightly below the specific gravity required by the U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 158.

Jensen, H. R.: Seven out of twelve samples of terebene satisfied the official requirements as to density, but not as to optical inactivity.—Evans' An. Notes, 1914, p. 67.

Mann, E. W.: Three large batches of terebene showed a specific gravity of from 0.856 to 0.865; optical rotation, −0.35° to +0.15°.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 40.

TEREBINTHINA.

Record, Samuel J.: Prolonging the naval stores industry. An illustrated description of methods for tapping pine trees for turpentine.—Sci. Am. 1914, v. 110, p. 173, 186.

Enz, Karl: Turpentine and oil of turpentine, with the official Ph. Germ. V. tests and requirements.—Apoth.-Ztg. 1914, v. 29, p. 785–787.

Süntola, S. C.: The determination of ordinary turpentine in Venetian turpentine, according to the method proposed by L. C. Walbum.—Pharm. Zentralh. 1914, v. 55, p. 2–4.

van Itallie and Weidner: A study of the nature and constituents of *Terebinthina laricina*.—Apoth.-Ztg. 1914, v. 29, p. 235–236.

TEREBINTHINA CANADENSIS.

Mann, E. W.: Four samples of Canada balsam have been examined, the results being normal throughout. The acid value ranged from 74.5 to 85.7 and the saponification value from 87.4 to 96.6.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 9.

Schimmel & Co.: A sample of Canada balsam, received from Quebec, having an optical rotation of +1.5412 when distilled with steam yielded a colorless oil, with an aroma resembling that of the cones of *Abies pectinata*.—Semi-Ann. Rep. April, 1914, p. 40.

Beath and Sayre: Oregon balsam. A discussion on the origin of the product.—J. Am. Pharm. Assoc. 1914, v. 3, p. 28–30.

THEOBROMA.

Häussler, E. P.: A short contribution on the history of theobroma.—Pharm. Zentralh. 1914, v. 55, p. 46–47.

Cradwick, W.: The cultivation of cacao.—J. Jamaica Agric. Soc. 1914, v. 18, p. 116–118, 162–164. See also Beihefte zum Tropenpflanzer, 1914, v. 15, p. 135–307.

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Book review of a volume on the Fermentation of Cacao, edited by H. H. Smith. London: John Bale, Sons, and Danielsson, Ltd.—Nature, 1914, v. 92, p. 628.

Driessen, J. H.: The shell of the cacao bean. The theobroma shell content of cacao and of chocolate.—Compt. rend. Congr. Internat. Pharm. 1913, 1914, v. 2, p. 1071–1074.

Häussler, E. P.: The quantitative determination of hulls in cacao and in chocolate.—Arch. Pharm. 1914, v. 252, p. 424–429.

E'we, G. E.: The 10 samples of powdered cocoa examined ranged between 15.6 and 20.5 per cent fat and were labeled "fat free."—Proc. Pennsylvania Pharm. Assoc. 1914, p. 135.

Mansfield, M.: Of 35 samples of cacao and chocolate examined 4 were found to be inferior products.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 68, p. 524.

Moudy, Ross B.: Reports 11 samples of chocolate; 4 not passed.—Bull. Wyoming D. F. & Oil Dept. 1914, v. 2, No. 4, p. 6.

For additional references on cacao see Exper. Sta. Rec.; Chem. Abstr.; Ztschr. unters. Nahr u. Genussm.

THEOBROMINE.

Chevalier, J.: Crystallized theobromine and the impurities contained in commercial theobromine.—Nouv. remèdes, 1914, v. 31, p. 265–269.

Wagenaar, M.: Microchemical reactions for caffeine, theobromine, theophylline, and their derivatives by sublimation.—Pharm. Weekblad, 1914, v. 51, p. 23–24.

THEOBROMINE SODIUM SALICYLATE.

Editorial: Diuretin appears in the Ph. Brit. V. as theobrominae et sodii salicylas.—Am. Druggist, 1914, v. 62, p. 404. See also Chem. & Drug. 1914, v. 85, p. 487.

Puckner and Leech: Theobromine sodium salicylate versus "diuretin"; the economical aspect, with a report of the details of analysis.—Rep. Chem. Lab. Am. M. Assoc. 1914, v. 7, p. 7–12; also J. Am. M. Assoc. 1914, v. 62, p. 1108–1109.

Linke, H.: Commercial preparations of theobromine sodium salicylate vary in water content. Three samples contained from 1.5 to 7.95 per cent of moisture.—Apoth.-Ztg. 1914, v. 29, p. 6794.

Jensen, H. R.: One sample of sodium theobromine salicylate yielded 43.2 per cent theobromine; sodium monoxide, 13.8 per cent.—Evans' An. Notes, 1914, p. 65.

Fitz, R.: The immediate effect of repeated doses of theobromine sodium salicylate and theocin on renal function in acute experimental

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nephritis.—Arch. Int. Med. 1914, v. 13, p. 945–956. See also v. 14, p. 827–843.

Taylor, Lester: Clinical studies in caffeine and a comparison with theobromine sodium salicylate.—Ann. Rep. Therap. Res. Com. 1914, v. 3, p. 118–130.

Jarisch, Adolf: On the mechanism of diuretin glycosuria.—Arch. ges. Physiol. 1914, v. 158, p. 502–508.

THYMOL.

Anon.: The present scarcity of the antiseptic thymol. The source of thymol and some of the substitutes that have been suggested.—Bull. Imp. Inst. 1914, v. 12, p. 599–605. See also Perf. & Ess. Oil Rec. 1914, v. 5, p. 372–373, and Chem. & Drug. 1914, v. 85, p. 452.

Redman, Weith, and Brock: A rapid volumetric method for determining *o*, *m*, and *p*-cresols, thymol, and phenol.—Chem. News, 1914, v. 110, p. 168–169, 176–179.

Whiting, A. D.: A 5 per cent solution of thymol in alcohol has a distinct antiseptic power, but it is not markedly germicidal.—J. Am. M. Assoc. 1914, v. 63, p. 475; also Tr. Am. M. Assoc. Sec. Pharm. & Therap. 1914, p. 143.

Seidell, Atherton: The analysis of thymol capsules. No indication was obtained of harmful impurities which might account for accidental cases of poisoning sometimes noted in the thymol treatment of hookworm.—Bull. Hyg. Lab. No. 96, p. 63–65.

TINCTURÆ.

U. S. P. IX: Abstract of proposed changes in formulas and requirements for the official tinctures.—J. Am. Pharm. Assoc. 1914, v. 3, p. 544–549, and Abstr. Prop. Changes, Part 3, 1914, p. 21–25.

Llewellyn, H. D.: The tinctures should retain their present strengths and working directions. The assayed tinctures and their processes to be left so that the average retail pharmacist can do the work in his own store.—Proc. Missouri Pharm. Assoc. 1914, p. 143.

Mittelbach, Wm.: Most of the official tinctures will remain as they are. The fineness of the powdered drugs has been reduced from 60 to 40 in many instances.—Proc. Missouri Pharm. Assoc. 1914, p. 107.

Editorial: In the Ph. Brit. V all tinctures of potent drugs are put on the 10 per cent basis.—Bull. Pharm. 1914, v. 28, p. 444.

Anon.: Practically all pharmacopœias prescribe a strength of 1:5 for tinctures of ordinary medicines, and for the sake of international uniformity this relation should be preserved.—Pharm. Post, 1914, v. 47, p. 786.

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Bohrisch, P.: A review of some of the recent comments on the Ph. Germ. V methods for making official tinctures.—Pharm. Zentralh. 1914, v. 55, p. 921–922; also Apoth.-Ztg. 1914, v. 29, p. 902.

Gray, Wm.: There should be some form of standardized concentrated preparation of the assayed drugs which could be diluted to make U. S. P. tinctures for the benefit of pharmacists who can not afford to make such tinctures, with the assay process for the same.—J. Am. Pharm. Assoc. 1914, v. 3, p. 901. See also Editorial: Am. Druggist, 1914, v. 62, p. 278.

Porterfield, W. P.: The practice of diluting strong preparations to a weaker dilution, as in the making of tinctures from fluid extracts, is very often the source of adulterated samples.—Proc. North Dakota Pharm. Assoc. 1914, p. 78; also Northwestern Druggist, 1914, v. 15, September, p. 38.

Curry, Gordon L.: All of the more frequently used tinctures should be made whenever possible from assayed drugs and with great care.—Proc. Kentucky Pharm. Assoc. 1914, p. 59.

Wilbert, M. I.: Official and other tinctures. The need for adapting the menstruum to the drug.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1660–1663.

Heinselmann: Rational methods for the making of tinctures and the desirability of providing for adequate control of this class of preparations by the pharmacist.—Pharm. Post. 1914, v. 47, p. 753–754. See also editorial comment, p. 754.

Richter, R.: A contribution on the testing of tinctures. The relation of extract content to the specific gravity.—Pharm. Zentralh. 1914, v. 23–33; also Apoth.-Ztg. 1914, v. 29, p. 211.

Caesar & Loretz: The determination of the extract content of tinctures.—Jahres-Ber. 1914, p. 68–69.

Anselmino, O.: A contribution on the testing and the control of tinctures, with a compilation of accumulated data on several of the more widely used preparations.—Arb. Pharm. Inst. Univ. Berl. 1914, p. 24–33. See also Freund, Hans: Apoth.-Ztg. 1914, v. 29, p. 406–407.

Lewis S. Judd: The mineral constituents of certain tinctures and drugs.—Pharm. J. 1914, v. 93, p. 126–128; also Year-Book of Pharmacy, 1914, p. 361–369.

Varnum, Walter H.: There are probably as many tinctures found above as below standard strength. The lack of uniformity is explained by the methods used to produce some of the U. S. P. preparations.—Western Druggist, 1914, v. 36, p. 277–278.

Rupp, E.: The pharmacist who prepares his own tinctures should not be required to test them.—Südd. Apoth.-Ztg. 1914, v. 54, p. 302.

Becker, I. A.: The alcoholic preparations of the Pharmacopœia—fluid extracts, tinctures, spirits, etc.—should have the alcohol content

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of the finished product stated definitely.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1025.

Mossler and Markus: A rapid, simple, and readily followed method for the determination of the alcohol content of tinctures.—Pharm. Post, 1914, v. 47, p. 291–294, 315–318; also Apoth.-Ztg. 1914, c. 29, p. 466–467.

Wratschko, Franz: Observations on the refractodensimetry of tinctures. An experimental study on the possible uses of the refractometer in the valuation of tinctures.—Ztschr. Allgem. österr. Apoth.-Ver. 1914, v. 52, p. 285, 297, 315, 332, 343. See also Mossler, Gustave: p. 355–356.

Roth, Richard: Fluid extracts, tinctures, and liquid preparations generally are best kept in amber-colored bottles away from the light.—Southern Pharm. J. 1914, v. 6, p. 483; also Bull. Pharm. 1914, v. 28, p. 480.

Lythgoe, Herman C.: Three hundred and seventy-six samples of tinctures were examined, 53 of which were adulterated.—Rep. Massachusetts Bd. Health, 1913, 1914, p. 409.

TINCTURÆ, N. F.

Amos, W. S.: The tinctures proposed for admission to the National Formulary except two, cactus grandiflorus and saw-palmetto and santal, should be included. The reports in regard to the efficacy of tincture of cactus grandiflorus are conflicting, and it is thought that elixir saw-palmetto and santal would be a more useful preparation than the tincture.—J. Am. Pharm. Assoc. 1914, v. 3, p. 323.

Tincture of cactus.—Havaland, H. G.: Manufacturers and dealers frequently label cactus as "night-blooming cereus."—Drug. Circ. 1914, v. 58, p. 349.

Ellingwood, Finley: Cactus grandiflorus, a neglected heart remedy.—Am. J. Clin. Med. 1914, v. 21, p. 693–697.

Tincture of caramel.—Beal and Zoller: The preparation of pure sucrose and dextrose caramels.—J. Am. Pharm. Assoc. 1914, v. 3, p. 495–497.

Stockinger, O.: The nine lots of caramel examined assayed 35, 40, 45, 69, 47, 16, 50, 45, and 35 per cent, respectively, of the standard proposed by Upsher-Smith. All were free from carbonates.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 134.

Scoville, W. L.: Freshly prepared caramel contains formaldehyde from decomposition of the sugar, but old samples contain only the oxidation product—formic acid. All samples contain traces of furfurol.—Bull. Pharm. 1914, v. 28, p. 484.

Turner, Ardeshire K.: Note on the detection of caramel in non-saccharine spiritous liquors.—Chem. World, 1914, v. 3, p. 42.

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Tinctura ferri citro-chloridi N. F.—E'we and Vanderkleed: For the assay of tincture of ferric citro-chloride N. F., the U. S. P. method for the assay of tincture of ferric chloride is applicable.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1682.

Tinctura ferri pomata N. F.—J. D. Riedel, A.-G.: The specific gravity of tincture of ferrated extract of apples was found to vary from 1.021 to 1.030, the dry extract from 7 to 9.3 per cent, and the iron content from 0.52 to 0.56 per cent.—Riedel's Berichte, 1914, p. 45.

Tinctura persionis N. F.—Williams, Ed. E.: In making tincture of persionis, mix the cudbear with an equal amount of sand before percolating, as otherwise it is almost impossible to percolate it.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

Norwood, T. W.: A change from tincture of cudbear to the powdered drug as a coloring agent, where possible, would greatly lessen the comment from physicians and others as to variation in shade in our colored preparations and alcoholic preparations.—Drug. Circ. 1914, v. 58, p. 390.

Lilly, J. K.: One sample of powdered cudbear contained approximately 20 per cent sodium chloride.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Maines, E. L.: Cudbear was found to contain 7.83 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

E'we, G. E.: Four samples of cudbear examined were rated in coloring power by calling the strongest sample 100. They tested as follows: 100, 100, 86, and 81.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 137.

Patch, E. L.: Cudbear varies from 60 to 100 per cent in coloring power.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

TRAGACANTHA.

U. S. P. IX: Description elaborated. Ash not exceeding 3.5 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 408, and Abstr. Prop. Changes, Part 2, 1914, p. 50.

Gehe & Co.: The production of tragacanth is again below the average.—Handelsbericht, 1914, p. 120.

von Fellenberg, Th.: A contribution to our knowledge of tragacanth. A study of bassorin and bassorinic acid.—Mitt. Lebensm. Hyg. 1914, v. 5, p. 256–259.

Jensen, H. R.: Many specimens of apparently perfectly pure second-grade gum were examined, which possessed a mucilaginous value only about one-half that of the finest "Elect" samples.—Evans' An. Notes, 1914, p. 68.

Fromme, G.: The valuation of powdered tragacanth by means of cuoxam or ammoniated copper. The cuoxam method gives variable

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results.—Apoth.-Ztg. 1914, v. 29, p. 617–619. See also Caesar & Loretz: Jahres-Ber. 1914, p. 28–36.

Linke, H.: One sample of tragacanth was found to contain 2.4 per cent of ash. A second sample was adulterated, probably with acacia.—Apoth.-Ztg. 1914, v. 29, p. 673.

Mann, E. W.: The eight samples of tragacanth powder tested for ash were all well within the 4 per cent official maximum, the range observed being 1.84 to 2.37 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 25.

Caesar & Loretz: The determination of acacia in powdered tragacanth, with a table showing the limits for ash prescribed in the several pharmacopœias.—Jahres-Ber. 1914, p. 116.

E'we, G. E.: Powdered tragacanth varied more than 100 per cent in comparative consistency of mixtures with water. All lots examined answered all U. S. P. requirements and were free from Indian gum.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 159.

TRITICUM.

U. S. P. IX: Description elaborated. Qualitative test included. Ash not exceeding 3 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 409, and Abstr. Prop. Changes, Part 2, 1914, p. 51.

Anon.: Triticum in the Ph. Brit. V. is writ large as agropyrum.—Chem. & Drug. 1914, v. 85, p. 486.

Maines, E. L.: Dog grass was found to contain from 3.94 to 5.48 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

Rippetoe, J. R.: One sample of triticum was found to contain 39.69 per cent of water extract and 3.92 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

U. S. P. IX: For the fluid extract, the aqueous extract is to be evaporated to 800 cc. and 200 cc. of alcohol added as a preservative.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

TROCHISCI.

Allen, C. T.: Lozenge making at the dispensing counter. An illustrated description of the apparatus used.—Pharm. J. 1914, v. 92. p. 125.

Curry, Gordon L.: The official troches are largely replaced by compressed tablets. Their preparation is not justified unless upon prescription and with special formula.—Proc. Kentucky Pharm. Assoc. 1914, p. 59.

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TUBERCULIN.

Curry, Frank: The preparation and standardization of tuberculins.—Pharm. J. 1914, v. 92, p. 167-168.

Piorkowski: Tuberculosis remedies. A review of the methods and remedies that have been employed.—Apoth.-Ztg. 1914, v. 29, p. 19–21.

Whelan, J. H.: Strychnine-tuberculin treatment of hospital tuberculous cases.—Brit. M. J. 1914, v. 1, p. 1065–1066. See also p. 1213.

Solis-Cohen, Myer: The determination of the next dose in tuberculin therapy.—J. Am. M. Assoc. 1914, v. 63, p. 1386-1387.

Wilkinson, W. Carnac: Tuberculin, its use in the treatment of tuberculosis.—Practitioner, 1914, v. 93, p. 476–498.

Book review of a volume entitled "Plain Rules for the Use of Tuberculin." New York: William Wood & Company. London: R. Allan Bennet.—Boston M. & S. J. 1914, v. 171, p. 903.

Waugh, George E.: The use of tuberculin in surgical tuberculosis.—Am. Med. 1914, v. 20, p. 567-568.

Crowe, H. Warren: The controlled use of new tuberculin in the treatment of pulmonary tuberculosis.—Brit. M. J. 1914, v. 2, p. 490–491.

Detwiller, A. K.: The present status of tuberculin treatment.—Am. J. Clin. Med. 1914, v. 21, p. 125–126.

Editorial: The value of tuberculin. A review of several recently published papers.—Therap. Gaz. 1914, v. 38, p. 27–28.

Sahli, Hermann: Critical remarks on the lecture by Shaw on the present evidence for and against the use of tuberclin as a specific cure.—Brit. M. J. 1914, v. 1, p. 808–811.

Lyon, Thos. Glover: The consensus of opinion formed by unbiased observers is that no benefit arises from the injection of tuberculin and that, even when used with the greatest care, harmful results are liable to ensue.—Lancet, 1914, v. 187, p. 421.

Miller, Charles: A plea to check the activities of some of the tuberculin enthusiasts.—Lancet, 1914, v. 187, p. 266. See also Squire, J. Edward, p. 344.

Bronfrenbrenner and Rockman: A note on the purified antigen of Besredka in the serum diagnosis of tuberculosis.—Biochem. Bull. 1914, v. 3, p. 377–380. See also p. 381–385.

Bronfenbrenner, J.: On the clinical value of the serum skin test in tuberculosis.—Proc. Soc. Exp. Biol. 1914, v. 11, p. 90–92.

Leckie, A. J. Bruce: The cutaneous tuberculin reaction of von Pirquet.—Brit. M. J. 1914, v. 1, p. 1066–1068.

Krumbhaar and Musser: Diagnostic value of percutaneous tuberculin test (Moro).—Am. J. M. Sc. 1914, v. 147, p. 540–549.

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Leckie, A. J. Bruce: The percutaneous tuberculin reaction. Observations on 400 cases.—Lancet, 1914, v. 186, p. 305–306.

Friedenwald, Harry: The dangers of the ophthalmic tuberculin test.—Am. Med. 1914, v. 20, p. 568–572.

Mills, Walter: The various tuberculins have some value as diagnostic aids, but less value as curative agents.—J. Am. Inst. Homœop. 1914, v. 7, p. 21.

For additional references on tuberculin see Index Med.; Zentralbl. Exper. Med.; J. Am. M. Assoc.

ULMUS.

U. S. P. IX: Description elaborated. Qualitative test included.—J. Am. Pharm. Assoc. 1914, v. 3, p. 410, and Abstr. Prop. Changes. Part 2, 1914, p. 52.

Anon.: An illustrated description of *Ulmus campestris* L.—Chem. & Drug. 1914, v. 84, p. 550.

E'we, G. E.: Two samples of elm bark gave a uniform suspension of fibers in the proportion of 1 gm. to 40 cc. of cold water, indicating a normal proportion of mucilage. The samples were free from starch.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 137.

Rippetoe, J. R.: Two samples of elm bark were found to contain 8.10 and 9.30 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 438.

UNGUENTA.

Gift, W. J.: The art of ointment making is the most ancient art in history. Ointments are the oldest preparations known.—Proc. Indiana Pharm. Assoc. 1914, p. 58.

Henrard, Louis: The official (Ph. Belg.) ointments. A discussion of the uses and limitation of the several excipients.—Ann. Pharm. Louvain, 1914, v. 20, p. 145–163.

Editorial: The importance of well-made ointments is not generally recognized by physicians. It is almost impossible to secure an ordinarily smooth ointment by the method employed by the retail druggist.—Phys. Drug. News, 1914, v. 9, p. 294.

Anon.: Hydrogenated or hardened oils are growing in importance industrially and chemically. The hardened oils resemble tallow in consistency and general properties, but keep better. They seem worthy of trial as ointment bases.—Bull. Pharm. 1914, v. 28, p. 306.

Blumenschein, F. J.: While most of the pharmaceuticals are being standardized and methods for improvement in manufacture and marketing are being proposed, the ointments and allied products are being neglected.—J. Am. Pharm. Assoc. 1914, v. 3, p. 895.

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Raubenheimer, Otto: Do not dispense cerates and ointments when rancid, because they are very irritating.—J. Am. Pharm. Assoc. 1914, v. 3, p. 974.

Nitardy, F. W.: Ointments are preferably dispensed in collapsible tubes.—Am. Druggist, 1914, v. 62, p. 340. See also Grosh, Daniel M., Bull. Pharm. 1914, v. 28, p. 426.

Roth, Richard: Ointments should be taken from the stock container in such a way that little or no trimming of the remainder is necessary. This method allows of the least exposure to air and prevents deterioration.—Southern Pharm. J. 1914, v. 6, p. 483.

Curry, Gordon L.: All of the 24 official ointments, except mercurial ointment, are readily prepared in the retail drug store.—Proc. Kentucky Pharm. Assoc. 1914, p. 59.

Galloway, James: Ointments, their therapeutic value and their abuse.—Practitioner, 1914, v. 93, p. 736–744.

UNGUENTUM.

U. S. P. IX: Five per cent or more of the benzoinated lard may be replaced by white wax in southern latitudes and during the heated season in other localities.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1578, and Abstr. Prop. Changes, Part 6, 1914, p. 16.

Sayre, Edward A.: The present U. S. P. formula for ointment is a product that is too firm or stiff for even the hottest kind of weather. A more satisfactory product is made by using wax 140 and benzoinated lard 860.—Proc. New Jersey Pharm. Assoc. 1914, p. 80.

UNGUENTUM ACIDI BORICI.

U. S. P. IX: The paraffin is reduced to 50 gm. and the white petrolatum correspondingly increased.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1578, and Abstr. Prop. Changes, Part 6, 1914, p. 16.

Anon.: The latest revision of the Ph. Japon. discards the paraffin basis of boric-acid ointment for a simple ointment and glycerin.—Chem. & Drug. 1914, v. 84, p. 218.

Faber, Theodore: The determination of boric acid in ointments.—Pharm. Ztg. 1914, v. 59, p. 163–164. See also Enz, Karl, p. 313.

UNGUENTUM AQUÆ ROSÆ.

U. S. P. IX: The clause is omitted directing the omission of sodium borate when the ointment is used with metallic salts.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1578, and Abstr. Prop. Changes, Part 6, 1914, p. 16.

White, Jennie M.: Ointment of rose water, with a comparison of the formulas included in the U. S. P., Ph. Brit., and Ph. Germ.—Pacific Pharm. 1914, v. 8, p. 5.

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UNGUENTUM DIACHYLON.

U. S. P. IX: White petrolatum replaces olive oil in the ointment.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1578, and Abstr. Prop. Changes, Part 6, 1914, p. 16.

UNGUENTUM HYDRARGYRI.

Rupp, E.: The assay of mercurial ointment.—Apoth.-Ztg. 1914. v. 29, p. 724; also Südd. Apoth.-Ztg. 1914, v. 54, p. 323.

Beckers, Wilhelm: The determination of mercury in mercurial ointment.—Pharm. Ztg. 1914, v. 59, p. 422. See also Jaenicke, p. 450.

Lythgoe, Hermann C.: Of six samples of mercury ointment examined two were found to be adulterated and four genuine.—Rep. Massachusetts Bd. Health, 1913–14, p. 411.

E'we and Vanderkleed: Physical instability of mercurial ointments. It would be well to include in the U. S. P. directions to mix well before dispensing.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1683.

UNGUENTUM HYDRARGYRI DILUTUM.

U. S. P. IX: The mercury has been reduced from 33.5 per cent to 30 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1579, and Abstr. Prop. Changes, Part 6, 1914, p. 16.

UNGUENTUM HYDRARGYRI AMMONIATI.

Arends, Georg: Ointment of ammoniated mercury should be prepared only from the freshly precipitated salt.—Apoth.-Ztg. 1914. v. 29, p. 988.

UNGUENTUM HYDRARGYRI NITRATIS.

U. S. P. IX: Process modified. Quantity to be prepared has been reduced to 100 gm.—J. Am. M. Assoc. 1914, v. 3, p. 1578–1579, and Abstr. Prop. Changes, Part 6, 1914, p. 16–17.

Gift, W. J.: Ointment of mercury nitrate was introduced into the Edinburgh Pharmacopœia in 1772.—Proc. Indiana Pharm. Assoc. 1914, p. 58. See also Xrayser II, Chem. & Drug. 1914, v. 84, p. 563.

UNGUENTUM HYDRARGYRI OXIDI FLAVUM.

Arends, Georg: Ointment of yellow oxide of mercury should be prepared from the freshly precipitated oxide.—Apoth.-Ztg. 1914, v. 29, p. 988.

Rupp, E.: Outline of a simple method for the assay of mercuric oxide ointment.—Apoth.-Ztg. 1914, v. 29, p. 723; also Südd. Apoth.-Ztg. 1914, v. 54, p. 323.

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UNGUENTUM RESORCINI COMPOSITUM, N. F.

Nixon, C. F.: Modified formula for compound resorcin ointment.—Apothecary, 1914, v. 26, January, p. 21.

UNGUENTUM ZINCI OXIDI.

Llewellyn, H. D.: A mixture of equal parts of hydrated wool fat and petrolatum produces a more sightly ointment than that made with benzoinated lard.—Proc. Missouri Pharm. Assoc. 1914, p. 143.

Table showing some of the analytical results reported for zinc ointment.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Brown, Lucius P.	1	1	Bull. Tennessee F. & D. Dept. 1914, v. 1, p. 27
Lythgoe, Hermann C.	1	0	Rep. Massachusetts Bd. Health, 1913, 1914, p. 411.
Todd, A. R.	12	4	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R.	4	3	Bull. Michigan D. & F. Dept. 1914, January-February, p. 17. September-October, p. 16.

UVA URSI.

U. S. P. IX: The drug may include not more than 5 per cent of stems and other foreign matter. Description elaborated and a qualitative test included.—J. Am. Pharm. Assoc. 1914, v. 3, p. 410, and Abstr. Prop. Changes, Part 2, 1914, p. 52.

Linke, H.: The Ph. Austr. VIII maximum of 4 per cent of ash for uva ursi is well above the average for this drug, which has been found to vary from 2.1 to 3.8 per cent.—Apoth.-Ztg. 1914, v. 29, p. 540.

Rippetoe, J. R.: Two samples of uva ursi were found to contain 33.21 per cent of alcohol (30 per cent) extract, and 22.32 per cent of alcohol (20 per cent) extract, and 4.15 and 2.91 per cent of ash, respectively.—Am. J. Pharm. 1914, v. 86, p. 443.

Maines, E. L.: Uva ursi leaves were found to contain from 1.44 to 3.29 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

J. D. Riedel, A.-G.: Uva ursi contained from 2.1 to 5.3 per cent of ash and from 42.3 to 44.6 per cent of extract soluble in water.—Riedel's Berichte, 1914, p. 32.

U. S. P. IX: For the fluid extract, first menstruum to consist of glycerin 100 cc.: alcohol 300 cc., and water 500 cc.—J. Am. Pharm. Assoc. 1914, v. 3, p. 543, and Abstr. Prop. Changes, Part 3, 1914, p. 20.

Anon.: Uva ursi is now recommended as a substitute for buchu. This is a new suggestion.—Meyer Bros. Drug. 1914, v. 35, p. 327.

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VACCINE.

U. S. P. IX: The pustules of vaccinia or cowpox removed, under aseptic conditions, from vaccinated animals of the bovine species. It should be kept in a dark place, at a temperature between 4.5 and 15°.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1103, and Abstr. Prop. Changes, Part 5, 1914, p. 4.

Schröder, H.: History of evolution and the present-day status of vaccine treatment.—Therap. Monatsh. 1914, v. 28, p. 81–95.

Stewart, J. Reverdy: Outline of method employed in the production of vaccine.—J. Am. Pharm. Assoc. 1914, v. 3, p. 861.

Green, A. B.: The resistance of the vaccine virus to filtration.—J. Hyg. 1914, v. 14, p. 182–185.

Greeley, Horace: The organism of smallpox, chicken pox, and vaccinia.—Med. Rec. 1914, v. 86, p. 204–205.

Voigt: Vaccine virus is preferably kept at from 5 to 15° below zero.—Südd. Apoth.-Ztg. 1914, v. 54, p. 54.

Francis, Edward: There have been examined in the Hygienic Laboratory over 1,500,000 doses of vaccine virus without a single evidence of tetanus bacillus or its spore.—Hyg. Lab. Bull. No. 95, p. 73. See also Editorial: J. Am. M. Assoc. 1914, v. 63, p. 1032–1033.

Gody, Edmund F.: Vaccination is a surgical procedure; hence it demands surgical asepsis.—Boston M. & S. J. 1914, v. 170, p. 369–373.

Farmer, Alfred G.: A protest against the still too frequent use of "shields" in covering vaccination wounds.—J. Am. M. Assoc. 1914, v. 63, p. 2062.

Armstrong, W. E. H.: A rapid method of vaccinating against smallpox.—Brit. M. J. 1914, v. 2, p. 920.

Göppert, F.: The alleged harmful action of vaccine virus, and the precautions to be observed in vaccination.—Therap. Monatsh. 1914, v. 28, p. 674–681.

Diefendorf, Burke: The technic of vaccination. An illustrated description of a scarifier.—New York M. J. 1914, v. 100, p. 1120–1121.

Shalet, Louis: A simple method of vaccination.—J. Am. M. Assoc. 1914, v. 62, p. 1829. See also Force, J. H., p. 2042.

Apolant, E.: A contribution to the question of vaccination. Of 116 vaccinated persons exposed to smallpox no case of illness developed, while of 4 unvaccinated persons, 2 became ill.—Therap. Monatsh. 1914, v. 28, p. 656–657.

VALERIANA.

U. S. P. IX: Description elaborated. Ash not exceeding 20 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 411, and Abstr. Prop. Changes, Part 2, 1914, p. 53.

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Editorial: Valerian can be grown in clayey soil. It is quite extensively cultivated in England and in Germany.—Pacific Pharm. 1914, v. 7, p. 297.

Mann, E. W.: The limit of 10 per cent of ash for valerian rhizome introduced into the 1914 Ph. Brit. is a very stringent one. Eight commercial samples examined during the year have yielded from 9.5 to 40.5 per cent of ash.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 26.

Maines, E. L.: Valerian root was found to contain from 18.61 to 24.14 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

Dück: Two samples of valerian were found to contain 18.5 and 15.65 per cent of ash, respectively.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 235.

Rippetoe, J. R.: Four samples of valerian were found to contain from 16.46 to 26.40 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Caesar & Loretz: Seven samples of valerian root were found to contain from 19.43 to 28.37 per cent of ash. Three samples contained from 17.30 to 24.40 per cent of extract soluble in diluted 70 per cent alcohol.—Jahres-Ber. 1914, p. 39.

J. D. Riedel, A.-G.: Valerian contained from 6.8 to 10.3 per cent of ash, and from 26.7 to 30.9 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

Richter, R.: In determining the extractive in tincture of valerian, it should be remembered that continued heating or drying of the residue at 105° induces decomposition to such an extent that the resulting extract is no longer completely soluble in the original menstruum.—Pharm. Zentralh. 1914, v. 55, p. 27–28.

Editorial: American valerian, while not a narcotic, is classed as a nervine, and acts upon the spinal centers.—Phys. Drug. News, 1914, v. 9, p. 363.

VANILLA.

U. S. P. IX: Assay for vanillin to be included. Description elaborated. Ash not exceeding 6 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 411, and Abstr. Prop. Changes, Part 2, 1914, p. 53.

Gehe & Co.: The home of vanilla is Mexico and Central America, where it is still found wild, although it is also cultivated to a considerable extent. Cultivation is restricted by the large number of insect enemies.—Handelsbericht, 1914, p. 79–82.

Fauchère, A.: The cultivation of vanilla in Madagascar.—J. d'Agric. trop. 1914, v. 14, p. 105–109; also Perf. & Ess. Oil Rec. 1914, v. 5, p. 152–154.

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Mawbey, Wallace: Vanilla beans. The history of the origin of the drug and comparison of the Mexican and Bourbon processes of preparing it.—Am. Perf. 1914, v. 9, p. 241–242.

Gehe & Co.: Vanilla is gathered when the green fruit becomes yellowish and the drying and curing is the most important part of the planter's work.—Pharm. Zentralh. 1914, v. 55, p. 399.

Roure-Bertrand Fils: A review of the situation of the vanilla market, including Mexican, Bourbon, and Tahiti vanilla.—Sc. & Ind. Bull. April, 1914, p. 66–67.

Maines, E. L.: Vanilla beans were found to contain 0.40 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

U. S. P. IX: Method of making the tincture modified. Strength of alcohol somewhat reduced.—J. Am. Pharm. Assoc. 1914, v. 3, p. 548, and Abstr. Prop. Changes, Part 3, 1914, p. 25. See also Mittelbach, Wm.: Proc. Missouri Pharm. Assoc. 1914, p. 107.

La Wall and Forman: The principal factors to be taken into account in judging of an extract.—J. Am. Pharm. Assoc. 1914, v. 3, p. 25–28.

Marden, J. W.: The determination of acetanilide, vanillin, and coumarin in vanilla extracts.—J. Ind. & Eng. Chem. 1914, v. 6, p. 318.

Bradford, H. C.: The manufacture and composition of extract of vanilla for flavoring.—Drug. Circ. 1914, v. 58, p. 6–9.

Miller, H. Liscomb: Vanilla extract from the bean, with several formulas.—Spatula, 1914, v. 21, p. 127–128.

Editorial: Considerable diversity of opinion still prevails as to what per cent of alcohol will yield the finest extract of vanilla. So far as can be determined at the present time, 40 per cent brings about the best results.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 423–424.

E'we and Vanderkleed: Tincture of vanilla was found to dissolve lead and also to form precipitates containing lead.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1685.

Table showing some of the analytical results reported for tincture of vanilla.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E	24	6	Rep. Indiana Bd. Health, 1914, p. 396.
Hortvet, Julius	86	27	Rep. Minnesota D. & F. Com. 1914, p. 56.
Lythgoe, H. C	58	6	Rep. Massachusetts Bd. Health, 1914, p. 411.
Strode, Sylvanus E	18	5	Rep. Ohio D. & F. Div. 1914, p. 121.
Todd, A. R	1	1	Rep. Michigan D. & F. Com. 1914, p. 176.
Todd, A. R	1	1	Bull. Michigan D. & F. Dept. 1914, November-December, p. 22.

Notices of Judgment Nos. 2888, 2891, 2907, 2920, 2921, 2960, 3007, 3016, 3064, 3088, 3128, 3129, 3138, 3139, and 3307 relate to adulteration and misbranding of vanilla extract.—S. R. A.-Chem. 1914.

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Leggett, Wm.: Vanilla as a skin irritant.—Brit. M. J. 1914, v. 1, p. 1351.

Anon.: Vanilla essence may give rise to a troublesome dermatitis.—Drug. Topics, 1914, v. 29, p. 115. See also Editorial: Pharm. J. 1914, v. 92, p. 870.

VANILLINUM.

Lehmann, M.: The manufacture and chemical properties of vanillin. The detection of adulterants. The congealing point of pure vanillin is almost exactly 82°.—Chem.-Ztg. 1914, v. 38, p. 388–389, 402–403. See also Perf. & Ess. Oil Rec. 1914, v. 5, p. 150–151, and Comment: Chem. & Drug. 1914, v. 84, p. 856–857.

Anon.: The physical constants of vanillin obtained from oil of cloves and from guaiacol.—Südd. Apoth.-Ztg. 1914, v. 54, p. 331–332.

Umney, J. C.: Vanillin is the odorous constituent of the vanilla bean, although the value of vanilla beans is not in actual ratio to the percentage of vanillin.—Perf. & Ess. Oil Rec. 1914, v. 5, p. 15.

Häussler, E. P.: The reactions of vanillin.—Ztschr. anal. Chem. 1914, v. 53, p. 363–371, 691–695.

Jensen, H. R.: Four good samples of vanillin melted between 80° and 82.5°, the melting point always extending over 1° to 1.5°.—Evans' An. Notes, 1914, p. 69.

Cerdeiras, J.: The use of vanillin-hydrochloric-acid reaction for the recognition of volatile oils.—Pharm. Zentralh. 1914, v. 55, p. 339–341.

Sullivan, M. X.: The origin of vanillin in soils—vanillin in wheat and in the water in which wheat seedlings have grown.—J. Ind. & Eng. Chem. 1914, v. 6, p. 919–921.

Perkin, jr., and Robinson: Some derivatives of orthovanillin.—J. Chem. Soc. Lond. 1914, v. 105, p. 2375–2392.

VERATRUM.

U. S. P. IX: The dried rhizome and roots of *Veratrum viride*, known in commerce as American hellebore, with not more than 5 per cent of stems and other foreign matter. Description elaborated.—J. Am. Pharm Assoc. 1914, v. 3, p. 412, and Abstr. Prop. Changes, Part 2, 1914, p. 54.

Lloyd, John Uri: Characteristics and constituents of veratrum.—Eclectic M. J. 1914, v. 74, p. 226.

Mansfield, William: An illustrated description of green hellebore, *Veratrum viride*.—Pract. Drug. 1914, v. 32, p. 12.

J. D. Riedel, A.-G.: Veratrum contained from 8.1 to 10.3 per cent of ash, and from 22.7 to 34.5 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

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Vanderkleed, C. E.: Reports six assays of veratrum, from 1.30 to 2.14 per cent alkaloids; all above standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

U. S. P. IX: Tincture of veratrum changed to tincture of veratrum viride.—J. Am. Pharm. Assoc. 1914, v. 3, p. 548, and Abstr. Prop. Changes, Part 3, 1914, p. 25.

Rotheo and Rouyer: Report of a fatal case of poisoning by an infusion of fresh veratrum album root, which had been gathered under the mistaken impression that it was gentian.—Drug. Circ. 1914, v. 58, p. 80.

Boise, Eugene: The heart in shock and the action of veratrum viride on the heart.—New York M. J. 1914, v. 99, p. 983–987.

Macht, D. I.: The action of drugs on the isolated pulmonary artery. Veratrine has a tendency to cause a primary stimulation to contraction, but on the whole had no appreciable effect.—J. Pharmacol. & Exper. Therap. 1914, v. 6, p. 24.

French, J. M.: Veratrine is the remedy of choice in the treatment of fevers, when the case is sthenic in its nature, and the pulse full and bounding.—Am. J. Clin. Med. 1914, v. 21, p. 213.

Editorial: Veratrum is one of the most important medicines in the eclectic medicine case.—Eclectic M. J. 1914, v. 74, p. 153.

Roberts, Frederick: There is a danger from the administration of veratrum in pneumonia and cases should be carefully watched.—Ellingwood's Therap. 1914, v. 8, p. 135. See also Price, P. F.: p. 214–215.

VIBURNUM OPULUS.

U. S. P. IX: The dried bark of *Viburnum opulus*, with not more than 5 per cent of wood and other foreign matter. Description of powder to distinguish it from the powder of the bark of *Acer spicatum*.—J. Am. Pharm. Assoc. 1914, v. 3, p. 413, and Abstr. Prop. Changes, Part 2, 1914, p. 55.

Puckner, W. A.: Botanists and pharmaceutical chemists declare that viburnum opulus has not been on the American market for several years, if ever, and that the drug used as described in the U. S. P. is really the bark of another plant.—Rep. Council Pharm. Chem. 1914, p. 96.

Lilly, J. K.: The drug markets still offer the maple bark as genuine viburnum opulus. Proc. N. W. D. A. 1914, p. 263; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Beringer, George M., jr.: Of six samples of viburnum opulus examined, five were false viburnum opulus.—Proc. New Jersey Pharm. Assoc. 1914, p. 111.

Editorial: The National Formulary committee is to include a description for genuine viburnum opulus.—Drug. Circ. 1914, v. 57, p. 652.

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Rippetoe, J. R.: Three samples of viburnum opulus were found to contain from 20.40 to 22.30 per cent of alcohol (65 per cent) extract, and from 3.10 to 3.89 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Maines, E. L.: Cramp bark was found to contain from 1.45 to 3.50 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

VIBURNUM PRUNIFOLIUM.

U. S. P. IX: The bark may include not more than 5 per cent of wood and other foreign matter. Description elaborated.—J. Am. Pharm. Assoc. 1914, v. 3, p. 413, and Abstr. Prop. Changes, Part 2, 1914, p. 55.

Lilly, J. K.: There has been a tendency toward an increase in the percentage of stem bark in black haw.—Proc. N. W. D. A. 1914, p. 262; also Oil, Paint & Drug Rep. 1914, v. 86, September 30, p. 34.

Rippetoe, J. R.: Four samples of viburnum prunifolium were found to contain from 16.88 to 23.15 per cent of alcohol (65 per cent) extract, and from 4.40 to 9.01 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Maines, E. L.: Black haw, bark of root, granular, was found to contain from 11.54 to 15.41 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 424.

Lieb, C. C.: Fluid extract of viburnum stimulates the isolated uterus. Its action in dysmenorrhea is, therefore, not due to an effect on the uterus but to a depression of the central nervous system.—(Am. J. Obstet. & Dis. Wom. and Child. 1914, v. 69, No. 433) J. Am. M. Assoc. 1914, v. 62, p. 486.

Editorial: Viburnum prunifolium is less known than it should be. It is an agent which is efficacious without being toxic.—New York M. J. 1914, v. 100, p. 283–284.

Editorial: Viburnum prunifolium, or black haw, has been known and used by the eclectics for 50 or more years.—Nat. Eclect. M. Assoc. Quart, 1914–15, v. 6, p. 167. See also Eclectic M. J. 1914, v. 74, p. 541.

VINA.

Wagner, T. B.: The effect of legislation on the wine industry. Several processes employed in the production of wines.—J. Ind. & Eng. Chem. 1914, v. 6, p. 72.

Scoville, W. L.: Wine may be artificially aged in a few minutes by means of a combination of electric current and bubbling oxygen through it, but the flavor is reduced and its delicacy is spoiled as compared with the same wine aged in bottles by storage.—Bull. Pharm. 1914, v. 28, p. 526.

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Wagner, T. B.: In the production of sweet wines it is necessary to "fortify" the wine with brandy.—Oil, Paint & Drug Rep. 1914, v. 85, February 2, p. 35.

Houston, D. F.: A revision of the official definition of wine and the permissible correction of natural defects by additions to musts or wines.—S. R. A.-Chem. 1914, p. 415.

Anon.: The official wine statistics and reports on the preparation of wine.—Arb. k. Gsndhtsamte, 1914, v. 49.

von der Heide and Baragiola: The difference between acid content and acid degree of wine, demonstrated by two examples.—Ztschr. Anal. Chem. 1914, v. 53, p. 249–260.

Njegovan, Vladimir: A new method for the determination of extract in wine.—Ztschr. Anal. Chem. 1914, v. 53, p. 160–165.

Fleissig: An illustrated description of an apparatus for determining the alcohol content of wine; a minometer.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 265.

Baragiola and Godet: An exposition of the results of an examination of wine in the sense of the newer chemico-physical theories.—Ztschr. anal. Chem. 1914, v. 53, p. 100–114.

Kling and Lassier: The determination of the total tartaric acid in wines.—Ann. Falsif. 1914, v. 7, p. 410–416.

Schafer and Arbenz: The determination of pentoses and methyl pentoses in wine.—Mitt. Legensm. Hyg. 1914, v. 5, p. 161–172.

Utz: A review of recent literature relating to the chemical examination of wine and other alcohol-containing beverages.—Pharm. Praxis, 1914, v. 12, p. 429–432.

Notices of Judgment Nos. 2811, 2812, 2902, 2971, 2977, 3101, 3140, 3158, 3161, 3162, 3163, 3164, 3165, 3193, and 3271 relate to the adulteration and misbranding of wines.—S. R. A.-Chem. 1914.

For additional references on wines see Ztschr. unters. Nahr. u. Genussm.; Chem. Abstr.; and Chem. Zentralbl.

VINA MEDICATA.

Anon.: At the beginning of the nineteenth century wine was one of the four principle menstrua, and in countries like France medicinal wines were the favorite form of tonics for convalescents.—Pharm. Era, 1914, v. 47, p. 318–319.

Remington, J. P.: Wine as a menstruum is no longer useful. We can get 25 per cent better results out of a 25 per cent alcohol than we can get out of wine. The only valuable thing we get out of wine is the alcohol in it.—Proc. West Virginia Pharm. Assoc. 1914, p. 88.

Llewellyn, H. D.: The present wines of the Pharmacopœia might retain their present formulas and working directions, being a class of preparations seldom used.—Proc. Missouri Pharm. Assoc. 1914, p. 143.

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Curry, Gordon L.: The official medicated wines are all readily prepared without much time or labor. Most of them, however, should be allowed to stand several days before filtering.—Proc. Kentucky Pharm. Assoc. 1914, p. 59.

Editorial: Medicated wines; an interpretation of British law regarding the sale of alcohol containing wines.—Chem. & Drug. 1914, v. 85, p. 91–92. See also Pharm. J. 1914, v. 92, p. 161.

Wine of beef and iron.—Hague, George W.: The N. F. formula for beef, wine, and iron directs that alcohol be used and afterwards recovered by distillation. This gives the retail pharmacist a formula which is not practicable. The same can be said about wine of beef. Therefore, new formulas are needed for both of these preparations.—Merck's Rep. 1914, v. 23, p. 33.

Barnard, H. E.: Of seven samples of beef, iron, and wine examined, three, or 42.8 per cent, were found to be adulterated.—Rep. Indiana Bd. Health, 1914, p. 443.

Wine of pepsin.—Williams, Ed. E.: Many complain that the wine of pepsin is very unstable and hard to make a uniform product. A more satisfactory product is obtained by using sufficient brandy to furnish the alcoholic strength, detannate the brandy with milk before using it, and then add water enough to make the desired amount.—Proc. Wisconsin Pharm. Assoc. 1914, p. 23.

XANTHOXYLUM.

U. S. P. IX: The dried bark of *Xanthoxylum americanum*, known in commerce as Northern Prickly Ash Bark, and of *Xanthoxylum clava-herculis*, known in commerce as Southern Prickly Ash Bark, described separately.—J. Am. Pharm. Assoc. 1914, v. 3, p. 414, and Abstr. Prop. Changes, Part 2, 1914, p. 56.

Henkel, Alice: An illustrated description of *Xanthoxylum americanum* Mill., and of *Xanthoxylum clava-herculis* L.—Phys. Drug. News, 1914, v. 9, p. 154; also Spatula, 1914, v. 20, p. 407.

Rippetoe, J. R.: Five samples of xanthoxylum were found to contain from 4.80 to 7.50 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 443.

Maines, E. L.: Prickly ash bark was found to contain from 6.78 to 7.34 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 426.

Editorial: American xanthoxylum, or prickly ash, is a splendid tonic in lack of nervous tone and as a general diffusible tonic, stimulating the capillary circulation.—Phys. Drug. News, 1914, v. 9, p. 363.

YERBA SANTA.

Maines, E. L.: Yerba santa was found to contain 5.13 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 427.

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Anon.: A formula for Johnson's aromatic sirup of yerba santa.—Meyer Bros. Drug. 1914, v. 35, p. 298.

ZEA.

Maines, E. L.: Corn silk, dried, was found to contain from 5.38 to 7.61 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

ZINCI CHLORIDUM.

U. S. P. IX: Modified method of assay added.—J. Am. Pharm. Assoc. 1914, v. 3, p. 532, and Abstr. Prop. Changes, Part 3, 1914, p. 9.

Bateman, Ernest: A method for determining the amount of zinc chloride in treated wood.—J. Ind. & Eng. Chem. 1914, v. 6, p. 16–18.

ZINCI OXIDUM.

Heimann, H.: Process for obtaining pure zinc oxide from crude oxides, containing lead oxide. German Patent 271,136, November 14, 1912.—J. Soc. Chem. Ind. 1914, v. 33, p. 484.

Linke, H.: Commercial zinc oxide frequently contains objectionable quantities of lead.—Apoth.-Ztg. 1914, v. 29, p. 695.

Hill, C. A.: Of 247 samples of zinc oxide examined during the years 1910 to 1913, inclusive, the lead content varied from 100 to 4,000 parts per million. The arsenic content varied from 0.2 to 5 parts per million.—Chem. & Drug. 1914, v. 85, p. 23.

E'we, G. E.: One lot of zinc oxide was not completely soluble in ammonia, but assayed 99 per cent of pure zinc oxide and was otherwise U. S. P.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 159.

Baker, W. L.: Two lots of zinc oxide were below the U. S. P. standard for purity.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Rordorf, H.: A sample of zinc oxide was found which, while snow white, dry, and pulverulent when examined proved under the microscope to consist of larger fragments of zinc oxide, and ointments and pastes made from it always showed distinct particles of the material.—Schweiz. Apoth.-Ztg. 1914, v. 52, p. 33.

McWalter, J. C.: A patient taking mineral sulphates, and at the same time using a zinc oxide lotion for herpes, developed a characteristic sulphide of zinc dark hue all over the area affected.—Brit. & Col. Drug. 1914, v. 65, p. 405.

ZINCI PHENOLSULPHONAS.

Kebler, L. F.: Outline of method for the determination of zinc phenolsulphonate in compressed tablets.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1099.

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ZINCI STEARAS.

Gesell, Hans: The assay of zinc stearate.—Am. J. Pharm. 1914, v. 86, p. 120.

Roberts, J. G.: One sample of zinc stearate was of U. S. P. quality, with the exception that it gave an abnormal result with the U. S. P. alkalies, alkaline earth test.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 159.

ZINCI SULPHAS.

Araki, S.: Process of preparing of zinc sulphate from silicious zinc ores.—French Patent 464,038, Sept. 2, 1913.—J. Soc. Chem. Ind. 1914, v. 33, p. 484.

Hill, C. A.: Of 147 samples of zinc sulphate examined during the years 1910 to 1913, inclusive, the chloride content, calculated as zinc chloride, varied from 0 to 1.4 per cent. The percentage of samples conforming with the official requirements varied from 66 in 1910 to 88 in 1911.—Chem. & Drug. 1914, v. 85, p. 18.

Watts and Shape: Addition agents in the deposition of zinc sulphate solution.—Tr. Am. Electrochem. Soc. 1914, v. 25, p. 291–296.

ZINCI VALERAS.

Baker, W. L.: Two lots of zinc valerianate were below U. S. P. standards for purity.—Proc. Am. Assoc. Pharm. Chem. 1914, p. 211.

Becker, Henry C.: In the treatment of epilepsy, zinc valerate is perhaps next in value to the bromides. It may be given in doses of ½ to 2 grains, in capsules, from 20 to 30 minutes before meals.—Merck's Arch. 1914, v. 16, p. 36.

ZINCUM.

News Note: The production of zinc and spelter in 1913.—Oil, Paint & Drug Rep. 1914, v. 86, November 2, p. 27.

Stone, G. C.: Improvements in the metallurgy of zinc.—Tr. Am. Electrochem. Soc. 1914, v. 25, p. 161–168. See also Ingalls, W. R.: p. 169–178, and Richards, J. W.: p. 281–290.

Pring and Tainton: The electro-deposition of zinc at high current densities.—J. Chem. Soc. Lond. 1914, v. 105, p. 710–724.

Anon.: An illustrated account of a visit to the plant of the New Jersey Zinc Co.—Oil, Paint & Drug Rep. 1914, v. 86, November 2, p. 32F–32G.

Benedicks and Arpi: The alleged allotropic condition of zinc.—Ztschr. Anorg. Chem. 1914, v. 88, p. 237–254.

Salant and Kahn: Production of glycosuria by zinc.—J. Pharmacol. & Exper. Therap. 1914, v. 5, p. 512.

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ZINGIBER.

U. S. P. IX: The outer cortical layer may be either partially or completely removed. Jamaica, African, Calcutta, Cochin, and Japanese ginger described separately. Alcoholic extract not less than 4 per cent. Ash not exceeding 8 per cent.—J. Am. Pharm. Assoc. 1914, v. 3, p. 415, and Abstr. Prop. Changes, Part 2, 1914, p. 57.

Gehe & Co.: A table showing the origin of the ginger imported for the London market during the years 1912–13.—Handelsbericht, 1914, p. 116.

Patch, E. L.: Jamaica ginger contained 3.8 per cent of ash, and 3.6 to 6.3 per cent of alcohol extract.—J. Am. Pharm. Assoc. 1914, v. 3, p. 1287.

Rippetoe, J. R.: Five samples of ginger were found to contain from 4.98 to 6.20 per cent of alcohol extract and 3.30 to 4.75 per cent of ash.—Am. J. Pharm. 1914, v. 86, p. 439.

Maines, E. L.: Ginger was found to contain from 2.81 to 4.24 per cent of ash.—J. Am. Pharm. Assoc. 1914, v. 3, p. 425.

J. D. Riedel, A.-G.: Ginger contained from 4.3 to 6.6 per cent of ash and from 8.5 to 14.6 per cent of extract soluble in diluted (70 per cent) alcohol.—Riedel's Berichte, 1914, p. 33.

Mann, E. W.: Nine samples of powdered ginger all proved to yield less ash than the 6 per cent maximum now official, the figures obtained ranging from 3.1 to 5.4 per cent.—Ann. Rep. Southall Bros. & Barclay, 1914, p. 15.

Vanderkleed, C. E.: Reports six assays of ginger; found to vary from 4.33 to 9.61 per cent of oleoresin.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 160.

U. S. P. IX: Ether to replace acetone for making the oleoresin.—J. Am. Pharm. Assoc. 1914, v. 3, p. 551, and Abstr. Prop. Changes, Part 3, 1914, p. 28.

E'we, G. E.: Seven samples of oleoresin of ginger examined were all pungent in dilutions of 1:20,000, our arbitrary standard.—Proc. Pennsylvania Pharm. Assoc. 1914, p. 152.

U. S. P. IX: The tincture is to be made from No. 30 powder. Finished preparation to yield not less than 90 per cent of absolute alcohol by volume.—J. Am. Pharm. Assoc. 1914, v. 3, p. 548, and Abstr. Prop. Changes, Part 3, 1914, p. 25.

Wallis, James H.: In some of our dry counties much traffic is indulged in in the matter of essence of Jamaica ginger.—Proc. Idaho Pharm. Assoc. 1914, p. 15.

Shell, J. E.: Proposition to regulate the sale of essence of Jamaica ginger in general stores. Within the last year essence of ginger has been found on the market containing wood alcohol.—Proc. North

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Carolina Pharm. Assoc. 1914, p. 124–125; also Apothecary, 1914, v. 26, September, p. 24.

Table showing some of the analytical results reported for tincture of ginger.

Reporters.	Number of samples—		References.
	Examined.	Rejected.	
Barnard, H. E.	4	1	Rep. Indiana Bd. Health, 1914, p. 443.
Congdon, L.	18	17	Rep. Kansas Bd. Health, 1914, p. 100.
Hortvet, Julius	14	6	Rep. Minnesota D. & F. Com. 1914, p. 68.
Lythgoe, H. C.	1	1	Rep. Massachusetts Bd. Health, 1913, 1914, p. 411.
Sayre, L. E.	9	3	Bull. Kansas Bd. Health, 1914, v. 10, p. 26.

Häussler, F.: The official ginger is highly thought of by the natives of Haiti as a carminative. It is also used in diseases of the liver, particularly chronic hypertrophy.—Schweiz.-Apoth.-Ztg. 1914, v. 52, p. 277.

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HYGIENIC LABORATORY BULLETINS OF THE PUBLIC HEALTH SERVICE.

The Hygienic Laboratory was established in New York, at the Marine Hospital on Staten Island, August, 1887. It was transferred to Washington, with quarters in the Butler Building, June 11, 1891, and a new laboratory building, located in Washington, was authorized by act of Congress March 3, 1901.

The following *bulletins* [Bulls. Nos. 1–7, 1900 to 1902, Hyg. Lab., U. S. Mar.-Hosp. Serv., Wash.] have been issued:

*No. 1.—Preliminary note on the viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 2.—Formalin disinfection of baggage without apparatus. By M. J. Rosenau.

*No. 3.—Sulphur dioxid as a germicidal agent. By H. D. Geddings.

*No. 4.—Viability of the *Bacillus pestis*. By M. J. Rosenau.

No. 5.—An investigation of a pathogenic microbe (*B. typhi murium* Danyz) applied to the destruction of rats. By M. J. Rosenau.

*No. 6.—Disinfection against mosquitoes with formaldehyde and sulphur dioxid. By M. J. Rosenau.

†No. 7.—Laboratory technique: Ring test for indol, by S. B. Grubbs and Edward Francis; Collodium sacs, by S. B. Grubbs and Edward Francis, Microphotography with simple apparatus, by H. B. Parker.

By act of Congress approved July 1, 1902, the name of the "United States Marine-Hospital Service" was changed to the "Public Health and Marine-Hospital Service of the United States," and three new divisions were added to the Hygienic Laboratory.

Since the change of name of the service the bulletins of the Hygienic Laboratory have been continued in the same numerical order, as follows:

*No. 8.—Laboratory course in pathology and bacteriology. By M. J. Rosenau. (Revised edition, March, 1904.)

†No. 9.—Presence of tetanus in commercial gelatin. By John F. Anderson.

*No. 10.—Report upon the prevalence and geographic distribution of hookworm disease (uncinariasis or anchylostomiasis) in the United States. By Ch. Wardell Stiles.

*No. 11.—An experimental investigation of *Trypanosoma lewisi*. By Edward Francis.

*No. 12.—The bacteriological impurities of vaccine virus; an experimental study. By M. J. Rosenau.

*No. 13.—A statistical study of the intestinal parasites of 500 white male patients at the United States Government Hospital for the Insane; by Philip E. Garrison, Brayton H. Ransom, and Earle C. Stevenson. A parasitic roundworm (*Agamomermis culicis* n. g., n. sp.) in American mosquitoes (*Culex sollicitans*); by Ch. Wardell Stiles. The type species of the cestode genus *Hymenolepis;* by Ch. Wardell Stiles.

*No. 14.—Spotted fever (tick fever) of the Rocky Mountains; a new disease. By John F. Anderson.

*No. 15.—Inefficiency of ferrous sulphate as an antiseptic and germicide. By Allan J. McLaughlin.

*No. 16.—The antiseptic and germicidal properties of glycerin. By M. J. Rosenau.

*No. 17.—Illustrated key to the trematode parasites of man. By Ch. Wardell Stiles.

*No. 18.—An account of the tapeworms of the genus *Hymenolepis* parasitic in man, including reports of several new cases of the dwarf tapeworm (*H. nana*) in the United States. By Brayton H. Ransom.

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*No. 19.—A method for inoculating animals with precise amounts. By M. J. Rosenau.

*No. 20.—A zoological investigation into the cause, transmission, and source of Rocky Mountain "spotted fever" By Ch. Wardell Stiles.

*No. 21.—The immunity unit for standardizing diphtheria antitoxin (based on Ehrlich's normal serum). Official standard prepared under the act approved July 1, 1902. By M. J. Rosenau.

*No. 22.—Chloride of zinc as a deodorant, antiseptic, and germicide. By T. B. McClintic.

*No. 23.—Changes in the Pharmacopœia of the United States of America. Eighth Decennial Revision. By Reid Hunt and Murray Galt Motter.

No. 24.—The International Code of Zoological Nomenclature as applied to medicine. By Ch. Wardell Stiles.

*No. 25.—Illustrated key to the cestode parasites of man. By Ch. Wardell Stiles.

*No. 26.—On the stability of the oxidases and their conduct toward various reagents. The conduct of phenolphthalein in the animal organism. A test for saccharin, and a simple method of distinguishing between cumarin and vanillin. The toxicity of ozone and other oxidizing agents to lipase. The influence of chemical constitution on the lypolytic hydrolysis of ethereal salts. By J. H. Kastle.

*No. 27.—The limitations of formaldehyde gas as a disinfectant with special reference to car sanitation. By Thomas B. McClintic.

*No. 28.—A statistical study of the prevalence of intestinal worms in man. By Ch. Wardell Stiles and Philip E. Garrison.

*No. 29.—A study of the cause of sudden death following the injection of horse serum. By M. J. Rosenau and John F. Anderson.

†No. 30.—I. Maternal transmission of immunity to diphtheria toxine. II. Maternal transmission of immunity to diphtheria toxine and hypersusceptibility to horse serum in the same animal. By John F. Anderson.

†No. 31.—Variations in the peroxidase activity of the blood in health and disease. By Joseph H. Kastle and Harold L. Amoss.

†No. 32.—A stomach lesion in guinea pigs caused by diphtheria toxine and its bearing upon experimental gastric ulcer. By M. J. Rosenau and John F. Anderson.

*No. 33.—Studies in experimental alcoholism. By Reid Hunt.

†No. 34.—I. *Agamofilaria georgiana* n. sp., an apparently new roundworm parasite from the ankle of a negress. II. The zoological characters of the roundworm genus *Filaria* Mueller, 1787. III. Three new American cases of infection of man with horsehair worms (species *Paragordius varius*), with summary of all cases reported to date. By Ch. Wardell Stiles.

†No. 35.—Report on the origin and prevalence of typhoid fever in the District of Columbia. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle. (Including articles contributed by Ch. Wardell Stiles, Joseph Goldberger, and A. M. Stimson.)

†No. 36.—Further studies upon hypersusceptibility and immunity. By M. J. Rosenau and John F. Anderson.

†No. 37.—Index-catalogue of medical and veterinary zoology. Subjects: Trematoda and trematode diseases. By Ch. Wardell Stiles and Albert Hassall.

No. 38.—The influence of antitoxin upon post-diphtheritic paralysis. By M. J. Rosenau and John F. Anderson.

†No. 39.—The antiseptic and germicidal properties of solutions of formaldehyde and their action upon toxines. By John F. Anderson.

†No. 40.—1. The occurrence of a proliferating cestode larva (*Sparganum proliferum*) in man in Florida, by Ch. Wardell Stiles. 2. A reexamination of the type specimen of *Filaria restiformis* Leidy, 1880=*Agramomermis restiformis*, by Ch. Wardell Stiles. 3. Observations on two new parasitic trematode worms: *Homalogaster philippinensis* n. sp. *Agamodistomum nanus* n. sp., by Ch. Wardell Stiles and Joseph Goldberger.

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4. A reexamination of the original specimen of *Tænia saginata abietina* (Weinland, 1858), by Ch. Wardell Stiles and Joseph Goldberger.

†No. 41.—Milk and its relation to the public health. By various authors.

†No. 42.—The thermal death points of pathogenic microorganisms in milk. By M. J. Rosenau.

†No. 43.—The standardization of tetanus antitoxin (an American unit established under authority of the act of July 1, 1902). By M. J. Rosenau and John F. Anderson.

No. 44.—Report No. 2 on the origin and prevalence of typhoid fever in the District of Columbia, 1907. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle.

†No. 45.—Further studies upon anaphylaxis. By M. J. Rosenau and John F. Anderson.

No. 46.—*Hepatozoon perniciosum* (n. g., n. sp.); a hæmogregarine pathogenic for white rats; with a description of the sexual cycle in the intermediate host, a mite (*Ielaps echidninus*). By W. W. Miller.

No. 47.—Studies on Thyroid: I. The relation of iodine to the physiological activity of thyroid preparations. By Reid Hunt and Atherton Seidell.

No. 48.—The physiological standardization of digitalis. By Charles Wallis Edmonds and Worth Hale.

No. 49.—Digest of comments on the United States Pharmacopœia. Eighth decennial revision for the period ending December 31, 1905. By Murray Galt Motter and Martin I. Wilbert.

No. 50.—Further studies upon the phenomenon of anaphylaxis. By M. J. Rosenau and John F. Anderson.

No. 51.—Chemical tests for blood. By Joseph H. Kastle.

No. 52.—Report No. 3 on the origin and prevalance of typhoid fever in the District of Columbia (1908). By M. J. Rosenau, Leslie L. Lumsden, and Joseph H. Kastle.

No. 53.—The influence of certain drugs upon the toxicity of acetanilide and antipyrine. By Worth Hale.

No. 54.—The fixing power of alkaloids on volatile acids and its application to the estimation of alkaloids with the aid of phenolphthalein or by the Volhard method. By Elias Elvove.

No. 55.—Quantitative pharmacological studies; adrenalin and adrenalin-like bodies. By W. H. Schultz.

No. 56.—Milk and its relation to the public health. (Revised edition of Bulletin No. 41.) By various authors.

No. 57.—I. The presence of tubercle bacilli in the circulating blood in clinical and experimental tuberculosis. By John F. Anderson. II. The viability of the tubercle bacillus. By M. J. Rosenau.

No. 58.—Digest of comments on the Pharmacopœia of the United States of America, (eighth decennial revision) and the National Formulary for the period ending December 31, 1906. By Murray Galt Motter and Martin I. Wilbert.

No. 59.—The oxidases and other oxygen catalysts concerned in biological oxidations. By Joseph Hoeing Kastle.

No. 60.—A study of the anatomy of Watsonius (n. g.), Watsoni of man, and of 19 allied species of mammalian trematode worms of the superfamily Paramphistomoidea. By Ch. Wardell Stiles and Joseph Goldberger.

No. 61.—Quantitative pharmacological studies; Relative physiological activity of some commercial solutions of epinephrin. By W. H. Schultz.

No. 62.—The taxonomic value of the microscopic structure of the stigmal plates in the tick genus Dermacentor. By Ch. Wardell Stiles.

†No. 63.—Digest of comments on the Pharmacopœia of the United States of America (eighth decennial revision) and the National Formulary (third edition) for the calendar year ending December 31, 1907. By Murray Galt Motter and Martin I. Wilbert.

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